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Editorial

Sharon Joy Ng, MA, PhD
Professor Emerita of Psychology
Department of Psychology
Yuba Community College District
Marysville, California, USA
E-mail: sng@yccd.edu

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Expanding the Realms of Consciousness

Sharon Joy Ng, MA, PhD

Professor Emerita of Psychology, Department of Psychology, Yuba Community College District, California, USA

One of the more satisfying aspects of the transpersonal approach to understanding human behavior is its emphasis on the experiential nature of investigation. This implies that we can best understand the nature of human consciousness through our direct experience of the various states of consciousness available to us. Transpersonal psychology is directed towards expanding traditional approaches to understand the psyche through research that takes us into understanding how consciousness itself can be the means, or vehicle, to effect healing at a profoundly deep level. I have written in a previous editorial that evolving beyond the medical model is taking psychology into research that examines “the contemplative practices (e.g., how meditation affects brain structure, physiology, and well-being), energy medicine, and alternative holistic therapies as well as renewed interest in research” into psychedelics. These means are providing relief when traditional methods of psychiatric or psychological intervention fail. If we are to tap into the fullness of the human psyche to effect healing, our current models of the psyche need expansion. In this editorial, we will examine an oft-neglected realm of experience from which our psyche is shaped. This realm was described and advanced by Stanislav Grof, wherein he argues that without consideration of the basic pre-natal matrices (BPM), psychology is missing an important area of the unconscious that gives rise to our psychic processes. We need to expand the realms of consciousness which most psychologists explore to gain greater insight into mental problems that may arise spontaneously from the psyche, such as during psychotic episodes in spiritual emergencies, or imagery that can accompany psychedelic therapies.

Traditional psychology acknowledges and applies the theories that explore the unconscious as described by Sigmund Freud. Jungian analysts add an additional realm to their explorations, namely the collective unconscious. Few psychological theories have posited the intrauterine experience and birth process as significant factors that shape our psyche, but Grof argues that unless we consider three realms of consciousness, therapeutic interventions may not effectively address a person’s psyche. These three realms would include the unconscious as described by Freud, the personal and collective unconscious as proposed by Carl Jung, but would expand the territory of the unconscious to include the peri-natal realm, or Grof’s BPM. The theories of Freud and Jung have been promulgated for decades and are beyond the scope of this editorial. The reader is referred to the original writings of these theorists to better understand their explanations for the realms of the unconscious, and the personal and collective unconscious. This editorial will focus on the four matrices of the BPM and the typical unconscious material that arises from these matrices, relating them to the characteristics inherent in each stage of the birth process.

The Realms of Consciousness

One characteristic of most psychodynamic theories is the belief that our psychological makeup is the result of our personal experiences and the perceptions we have formed from the time of our birth to the present. It is referred to as our biographical history. From this premise, psychodynamic and cognitive interventions are aimed at uncovering, discovering, and resolving conflicts that arise from those sources. The theory of Carl Jung is an exception to this limitation because he proposed that archetypes in the collective unconscious exert their influence on human behavior at the level of genetic psychoid inheritance. These archetypes are evolutionary mechanisms that influence human apprehension, perception, and behavior.
It is significant to note that none of the earlier psychodynamic theories addressed the significance of our experiences in utero. Otto Rank\(^{8}\) was one exception in that he believed that it was birth itself that traumatizes us and how this experience forever marks our need for symbiosis and the desire for the symbolic “return to the womb,” a time when all our needs were met perfectly and effortlessly. Grof proposed that we could not fully understand the human psyche unless we also examined psychic material that was imprinted during our intrauterine time and through the stages of birth.

Each of us experience different factors in the uterine experience that range from the health of our mothers to emerging from the womb in different positions or through caesarian birth. As Grof pointed out, traditional psychology acknowledges the importance of our experiences of nursing at our mother’s breast, yet neglects to include the impact of earlier experiences in the womb and the process of birth. Most therapies only consider post-natal personal experiences as the source of mental disturbance (or biological explanations), but without considering the impact of our peri-natal experience, is our understanding of the psyche complete? This is especially important to consider if a person’s problems cannot be attributed to personal experience or archetypal influences. If the uterine experience was toxic and the birth process problematic and prolonged, the result could be psychiatric symptoms that mimic the experience of what was encountered in the womb or the birth process.\(^{3}\)

**Basic Peri-Natal Matrices (BPM)**

Grof divided the peri-natal matrices into four stages and proposed that the characteristics and unique experience within those matrices could give rise to psychiatric symptoms that may not be easily explained by relating them to one’s personal unconscious. The time in the womb is referred to as the BPM-I, followed by BPM-II, BPM-III and BPM-IV, the three stages of birth respectively.

There is some argument that the trauma of birth is not “remembered” by the infant because there is insufficient hyalinization of the cortex at that stage of development. However, Lipton\(^{9}\) describes the epigenetic process that unfolds while we are in the womb and demonstrates that the fetus has awareness and responds to the external environment. The mother’s emotional state, hormonal environment, and intake of exogenous sources, such as drugs, all register in the experience of the neonate and fetus. Usually, our time in the womb is seen as a time when the physical unfolding of the human form occurs in preparation for birth, but Lipton’s work clearly demonstrates that we are learning about the environment and are being conditioned even while in the womb.

The importance of early bonding and the nursing experience are acknowledged as foundational to forming our basic sense of safety, security and love. Grof reasoned that if these early experiences of being nursed and the nuances of the early nursing experience convey a sense of being loved and nurtured, then it is reasonable to assume that psychological imprinting also occurs during our experience in the womb and through the three stages of the birth process that may impact our well-being. If there is a memory of the nursing experience, there must be a memory of the birth process. Traditional psychological approaches do not seek to access or explore this realm, generally focusing only upon the post-natal experiences when searching for a causative experience for mental disturbance in later life. Although, we may not have conscious memories of the birth process, the dilemmas that can result from the birth process characterize many feelings that we have: Being stuck with no way out, feeling choked off or squeezed to death, and seeing the light at the end of a tunnel as we emerge from a situation or event.

The first peri-natal matrix, or the BPM-I, includes the usual 40 weeks in the womb. The health and mental status of the mother is vital to the health of the developing fetus, both physically and psychologically. The experience in the womb of a healthy mother can give rise to feelings of having been nurtured in the womb, or “good womb.” The “good womb” experience can give rise to feelings later in life of having important needs satisfied, remembering happy moments from infancy and childhood (good mothering, play with peers, harmonious periods in the family, etc.), feeling fulfilling love, romance; trips or vacations in beautiful natural settings; exposure to artistic creations of high aesthetic value, swimming in the ocean and clear lakes.\(^{3,10}\) Conversely, if the mother is a drug addict or suffering from physical or mental problems, the experience could be characterized as the “bad womb.”

As we consider the first stage of birth, or BPM-II, the blood supply, nourishment, oxygen and the removal of waste products are cut off as contractions of the uterus begin. This is an uncomfortable time when the cervix is not yet opened; therefore, the fetus must endure the contractions until dilation of the cervix proceeds to allow the passage of the fetus. Psychological distress later in life is analogous to this stage when we may feel constricted in our lives, being stuck with no way out, or claustrophobic. The BPM-II also gives rise to memories of “situations endangering survival and body integrity (war experiences, accidents, injuries, operations, painful diseases, near drowning, episodes of suffocation, imprisonment, brainwashing, and illegal interrogations, physical abuse, etc.); severe psychological trauma (emotional deprivation, rejection, threatening situations, oppressive family atmosphere, ridicule and humiliation, etc.).”\(^{7,10}\)

In the second stage, BPM-III, when the cervix opens, we struggle through the birth canal. Now we are able to begin the
journey through the birth canal, with the inherent pressure from contractions but this time having some movement towards our emergence. This matrix gives rise to our feelings of having had enough of oppression or abuse and we make efforts to free ourselves. It is similar to when we have “had enough” of a situation and are determined to find a solution and act accordingly. Other emotions that may arise are memories of struggles, fights, and adventurous activities (experiences in military service, rough airplane flights, cruises on stormy ocean, hazardous car driving, boxing); highly sensual memories (carnivals; amusement parks and nightclubs, wild parties, sexual orgies, etc.); childhood observations of adult sexual activities; experiences of seduction and rape; in females, delivering their own children.3,10

Reports from case studies conducted by Grof and others recount experiences that range from identification with what humans face when they are imprisoned, locked in wards, living in totalitarian countries or experiences in torture chambers. This is likened to the first stage of birth, or BPM-II. Transpersonal experiences of the BPM-III realm reflect the struggle in the birth canal. Here, participants have experienced scenes from wars and revolutions; or, a feeling of having had enough of oppression and one rises up to free oneself. Being stuck in the birth canal could give rise to experiences of being in hell and surrounded by infernal landscapes.

Lastly, we emerge from the birth canal (BPM-IV) and “see the light at the end of the tunnel.” Memories of “fortuitous escape from dangerous situations, such as the end of war or revolution, survival of an accident or operation; overcoming severe obstacles by active effort; episodes of strain and hard struggle resulting in a marked success. This emergence from the birth canal is represented by immersion in natural scenes, such as the beginning of spring, the end of an ocean storm, (or) witnessing a sunrise.3,10

SUMMARY

Expanding the realms of consciousness to include the intrauterine experiences and the subsequent birth process as times when the psyche is imprinted, broadens the territory to be explored in therapy. Without considering the peri-natal realm of consciousness as a source of psychological imprinting, we miss entire realms of unresolved traumas “imprinted” on our psyche. Consider how imprinting is affected upon our psyche when labor is prolonged, problematic, or results in a cesarean section birth? Is the psyche of one who is delivered via C-section different from one who has traversed the entire length of the birth canal and emerged from that passage? And what of the crowded conditions for those who shared the womb as twins, triplets or multiple births? Further research and inquiry into these differences is recommended to identify and describe any differences that may occur in these other types of birthing situations.

Consideration of the BPM’s can help clinicians to delve deeper into the psyche to help others achieve wellness and happiness. Limiting ourselves to traditional layers of the unconscious may impede our understanding of psychological problems and leave our work half done. Without these considerations, we are often left with therapeutic outcomes that are not fully processed emotionally because the material has not yet been brought fully into awareness to be incorporated, integrated, and processed emotionally.

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Coping With Trauma Among Children in South of Gaza Strip

Abdel Aziz Mousa Thabet, MBChB, DPM, DCAC, PhD*; Sanaa S. Thabet, MPH

*Child and Adolescent Psychiatry, School of Public Health-Child Institute-Gaza-Al Quds University, Palestine

**Director of Child and Family Training and Counseling Center-NGO, Palestine

ABSTRACT

Aim: This study aimed to investigate the relationship between trauma, mental health, and coping strategies among children living in south of Gaza Strip

Methodology: The sample consisted of 317 children and their parents. Children were interviewed with Gaza Traumatic Events Checklist, Children Post Traumatic Stress Disorder Reaction Index, (PTSD-RI) Strengths and Difficulties Questionnaire (SDQ) (Teachers, parents, and children forms), Spence Anxiety Scale, and Adolescent Coping Orientation for Problem Experiences (ACOPE).

Results: Palestinian children reported a mean of 9.34 traumatic events. Boys reported more exposure to traumatic events than girls. Results showed that 25.2% of children had PTSD. The present study showed the prevalence of general mental health problems using SDQ for self-reported, parents and teachers forms (19.4%, 24.3%, and 28.4%). Total score of anxiety was recorded as 41.15. Girls expressed more panic/agoraphobia and separation anxiety than boys. There was a significant correlation between total trauma and PTSD, PTSD and total coping strategies, ventilating feelings and PTSD, social support and PTSD, avoiding problems and PTSD.

Clinical applications: An outreach child mental health clinics with multidisciplinary staff need to be established at primary health centers to assess and treat children referred from community agencies and schools after exposure to traumatic events. Similarly, training courses for social workers, primary health workers, school counsellors in the field of trauma should be conducted.

KEYWORDS: Anxiety; Children; PTSD; SDQ; South Gaza; Trauma.


INTRODUCTION

With a population of 1.4 million people, the Gaza Strip is one of the most densely populated areas in the world with 3800 inhabitants/km² and a population growth of 4% per year. Seventy-eight percent of the population within Gaza are refugees and over half of the one million registered refugees are crammed into eight refugee camps managed by the United Nations Relief and Works Agency (UNRWA).

Eighty percent of the population in Gaza falls below the poverty line, with an income of US$ 2 per day (up from 30% in 2000) and the unemployment level stands at approximately 50%. In addition, people in Gaza have been subjected to military occupation, causing significant psychological trauma, particularly for children. In Rafah, the situation is particularly acute. According to the ministry of social affairs, 25% of all the people killed in Rafah were children, and one in four children have been injured. The decline in the well-being and quality of life of children in Gaza over the past 2 years has been rapid and profound.
Since the beginning of 2006, the situation has become more uncertain and can only be viewed with concern by the international organizations working in the West Bank and Gaza Strip. Specifically, this uncertainty is based on the results of the Palestinian Legislative Council elections at the end of January 2006 in which the Islamic Resistance Movement (Hamas) won 74 of the 132 seats. Following this election, the International community, through public statements issued by the Quartet for the Gaza disengagement, the United Nations (UN) and the European Union (EU) have asked the future Hamas-led government to commit to non-violence, to the recognition and to the acceptance of previous obligations (the Roadmap) in order to allow international donors to continue providing funds to the PA. Israel has announced that it will withhold monthly tax payments to the PA, amounting to between US$ 50 million and US$ 65 million per month and constituting about two-thirds of the income derived from Palestinian economic activity. 4

Trauma and Violence

Numerous studies have directly linked post-traumatic stress disorder (PTSD) among children to the violence and mobility restrictions experienced on a daily basis, including the death and injury of family and friends, damage to property, and the frustration and poverty they sustain through closures, curfews and home confinement. Children have witnessed loved ones being killed or injured; have spent childhood years searching for their belongings in the rubble of destroyed homes and schools, and are living in the reality that no place is a safe place. 5

Previous studies with children and adolescents exposed to political violence and armed conflict have predominantly focused on the impact of trauma on their mental health. 6 It is well established that exposure to political violence is positively correlated with mental health presentations (usually post-traumatic stress disorders and depression), often in a ‘dose-effect’ relationship. The underlying mechanisms have been more difficult to explore, because of the number of potentially confounding variables such as loss of loved ones, disruption of social networks, lack of basic health needs, or displacement. It is well established that exposure to political violence is positively correlated with mental health presentations (usually post-traumatic stress disorders and depression), often in a ‘dose-effect’ relationship. 5,11

Following the war in former Yugoslavia, the risk factors for post-traumatic and depressive disorders in children and young people were investigated and different patterns for the two types of psychopathologies were analyzed. Variance in post-traumatic stress symptoms was mainly explained by traumatic war experiences (20%) and individual and socioeconomic factors (17%), and less (9%) by cognitive appraisals and coping mechanisms. In contrast, depression was predicted by individual and socioeconomic factors (36%) and less by war experiences (8%), whilst cognitive appraisal and coping mechanisms did not contribute significantly. 12 Family adaptation to the Lebanese war was predicted by family resources and social support, and was associated with increased use of cognitive coping strategies. Also, perceived stress was a stronger predictor than the actual events experienced by families. 13

Different models and frameworks have been proposed and investigated and coping strategies adopted by young people in response to stressful events such as trauma. By using various coping strategies, individuals try to modify adverse aspects of their environment as well as to minimize internal threat induced by stress, in a dynamic and reciprocal relationship between emotions and coping. 14,15 Coping strategies have been broadly defined as problem-focused (acting on the environment or the individual) or emotion-focused (attempting to change the meaning of the event or how this is attended to). 16 They are often also classified as either primary (the judgment of an encounter as stressful) or secondary appraisal (evaluation of the potential effectiveness and consequences of using coping strategies). 17 Most research in young life arises from adolescents and young adults who suffered chronic illness, abuse-related trauma, or who have experienced other types of stressful events. 18 In recent years, there has also been increasing attention on the impact of war, trauma and political conflict on young people and their families, and the underlying mechanisms involved.

It is important to note that not all coping responses are specific to the conflict, as these can be interlinked with universal adolescent developmental issues. For example, some concerns expressed by high school students in Jerusalem were specific to the conflict in the region, i.e., coping with aggression, war, and enlistment into the army, while other concerns were universal (self-image, peer relationships, and school). 19

The aims of this study were (1) To explore the consequences of trauma, in particular the extent to which children suffering from a range of behavioural and emotional disorders becomes the primary driver of violence at the individual, family and community level, (2) To find out the types of coping strategies used by children to overcome the consequences of trauma, (3) To explore the relationship between trauma, PTSD, mental health problems, and coping strategies.

METHOD

Participants

The population of this study includes a random sample of children attending governmental and UNRWA schools. According to literature, a sample of 5-7% of the population is representative of the population. From a total of 55,762 students enrolled in schools in the south of Gaza Strip (Rafah area), 6% of the total number of children i.e., 317 students were selected. Children aged between 9-16 years were included and the numbers of children were divided according to the percentage of children attending different schools.
MEASURES

Sociodemographic Characteristic Questionnaire

This questionnaire includes sex, age, place of residence, and family income.

Gaza Traumatic Events Checklist for Political Violence

This checklist consists of 28 items covering different types of traumatic events that a child may have been exposed to in the particular circumstances of regional conflict and political violence. This checklist covered three domains of trauma. The first domain covers witnessing the acts of violence such as witnessing killing of relatives, witnessing home demolition, bombardment, and injury of others. The second domain covers the hearing experiences such as hearing killing or injury of friends or relatives. While the third domain covers personal traumatic events such as being shot, injured, or beaten. This checklist can be completed by children of the age group 9-16 years (‘yes’ or ‘no’).

Child Post Traumatic Stress Reaction Index (CPTSD-RI)

This scale is a standardized 20-item self-report measure designed to assess post-traumatic stress reactions of children of 6-16 years following exposure to a broad range of traumatic events. It includes three subscales, intrusion (7 items), avoidance (5 items) and arousal (5 items), and three additional items. The scale has been found to be valid in detecting the likelihood of PTSD.

Items are rated on a 0-4 scale, and the range of total Child Post-Traumatic Stress Disorder Reaction Index (CPTSD-RI) scores is between 0-80. Scores are classified as ‘mild PTSD reaction’ (total score 12-24), ‘moderate’ (25-39), ‘severe’ (40-59), and ‘very severe reaction’ (above 60). The CPTSD-RI used in this study was based on Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-IIR) criteria, rather than using another PTSD instrument based on DSM-IV criteria, as the CPTSD-RI had already been validated in the Arab culture.

Strengths and Difficulties Questionnaire

The questionnaire is one of the most commonly used scales in the assessment of children’s strengths and difficulties in child psychiatry. It consists of 25 items, 14 describe perceived difficulties, 10 perceived strengths and one is neutral (‘gets on better with adults than with other children’). Each perceived difficulties item is scored on a 0-2 scale (not true, somewhat true, certainly true). Each perceived strengths item is scored in the reverse manner, i.e., 2: Not true, 1: Somewhat true, 0: Certainly true. There are three versions of this questionnaire, one for parents, teachers, and one for children above 11 years. The 25 SDQ items are divided into scales of hyperactivity, emotional problems, conduct problems, peer problems and prosocial scale (five items per scale). A score is calculated for each scale (range 0-10) and a total difficulties score for the four scales (excluding prosocial behaviour, which was considered different from psychological difficulties), i.e., a range of 0-40. The SDQ has been previously used in the Palestinian culture.

Spence Children’s Anxiety Scale

This measure consists of 44 items; of which 38 reflect specific symptoms of anxiety and 6 relate to positive, filler items to reduce negative response bias. Of the 38 anxiety items, independent judges considered 6 to reflect obsessive-compulsive problems, 6 separation anxiety, 6 social phobia, 6 panic/3 agoraphobia, 6 generalized anxiety/overanxious symptoms and 5 items concerning fears of physical injury. Items are randomly allocated within the questionnaire. Children are asked to rate on a 4 point scale involving never (0), sometimes (1), often (2) and always (3), the frequency with which they experience each symptom. The instructions state “Please put a circle around the word that shows how often each of these things happens to you. There are no right and wrong answers”. Given that the scale examines the occurrence of objective, clinical symptoms, it was considered appropriate to apply a frequency scale, rather than an intensity scale. The 0-3 ratings on the Spence Children’s Anxiety Scale (SCAS) are summed up for the 38 anxiety items to provide a total score (maximum=114), with high scores reflecting greater anxiety symptoms. Scores may also be produced for the anxiety subscales using items as outlined in Table 1. There are six, positively worded filler items. These include item 11 (I am popular among other kids of my own age), item 17 (I am good at sports), item 26 (I am a good person), item 31 (I feel happy), item 38 (I like myself) and item 43 (I am proud of my school work). Responses to each of the positively-worded filler items

| Table 1: Prevalence of General Mental Health Problems using SDQ by Self, Teachers, and Parents. |
|---------------------------------|-----------------|-----------------|-----------------|
| Abnormal                        | Teachers        | Parents         | Self-reported   |
| SDQ caseness                    | 28.4            | 24.3            | 19.4            |
| Hyperactivity                   | 3.8             | 6.3             | 4.7             |
| Emotional problems              | 7.8             | 19.8            | 9.9             |
| Conduct problems                | 47.0            | 53.3            | 40.3            |
| Peer problems                   | 21.2            | 27.8            | 18.5            |
are ignored in the scoring process. It was validated in Palestinian society before and showed high reliability.27

The Adolescent Coping Orientation for Problems Experiences28

The Adolescent Coping Orientation for Problem Experiences (A-COPE) is a self-report instrument that describes and measures coping strategies during adolescence. This is based on the theoretical framework of coping being viewed as one of the four components that interact and influence adolescent development and adaptation (the remaining three being demands, resources and definitions/meaning). This model was based on the integration of individual coping theory and family stress theory. The instrument consists of 54 items measuring specific coping behaviours that adolescents may use to manage and adapt to stressful situations. Each item is rated on a 5-point scale (1=never; to 5=most of the time) to indicate how often they use each coping strategy when feeling tense or facing a problem. The following 12 sub-scales (each consisting of between 2 and 8 items) were identified by principal-component analysis.29

Engaging in demanding activity (posing challenges to excel at something or achieve a goal through physical activity, schoolwork or improving oneself); developing self-reliance and optimism (direct efforts to be more organized and in charge of the situation, as well as to think positively); developing social support (helping others solve problems, talking to friends, apologizing); seeking diversions (efforts to keep busy and engage in relatively sedate activities such as sleeping, watching TV or reading); solving family problems (working out difficult issues with family members and having joint activities with the family); seeking spiritual support (focused on religious behaviours such as praying, going to church or talking to clergy); investing in close friendships (seeking closeness and understanding from a peer); use of humour (not taking the situation too seriously by joking or making ‘light’ of it); seeking professional support (getting help and advice from a professional such as a counselor or teacher about problems); relaxing (ways to reduce tension such as daydreaming, listening to music or cycling); ventilating feelings (expression of frustration and tension through yelling, blaming others, making mean comments, and complaining to friends or family); and avoiding problems (use of substances as a way to escape, or avoiding persons or issues that cause problems). The instrument was translated to Arabic language and was previously used in Gaza Strip.30

Study Procedure

Data was collected by 4 trained social workers and community mental health workers with previous experiences in data collection in similar projects (2 males and two females). They were trained by the consultant and project assistant on questionnaires of the study. Data collectors were provided with a prepared list of 10 schools names (6 from governmental sector and 4 from UNRWA) with number of children according to age and sex. They were permitted to enter the schools after getting permission from UNRWA and Ministry of Education (MoE) in Gaza and then they met the Rafah directors to give permission to the school head teachers to enter the schools. Children were randomly selected by choosing one class according to age from the registration book of the class. We obtained by a written agreement from the Ministry of Education and UNRWA education department to do the work in schools. A covering for each child was send to parents explaining the aim of the study and about their right not to participate with their children in study and ask them to sign the letter and send it back to school with children if they agree to participate with their children in the study.

Statistical Analysis

After the collected data was entered into the system using SPSS (SPSS win, Ver 20) for data entry and analysis and the validity and reliability of the instruments using split half method and Cronbach’s alpha equation. Descriptive statistics and frequencies were used to present the data patterns for the whole sample. Gender subgroups were compared on questionnaire continuous scores by two-tailed t-test. The association between exposure to trauma and violence and faction war and PTSD symptoms (CPTSD-RI), SDQ parents, teachers, and self, anxiety, coping strategy was investigated by a series of vicariate regression analysis. Finally, the interaction between exposure to trauma and each coping strategy was also included.

RESULTS

Sociodemographic Data

From a total of 317 children, parents and teachers responded to our study. The sample consisted of 161 boys which represented 50.8% and 156 girls which represented 49.2% of the student population. The children aged between 9-16 years recorded a mean age 12.51 (SD=2.2).

The boys’ mean age was 12.66 years (SD=2.1), and the girls’ mean age was 12.38 (SD=2.28). Palestinian families consisted of large number of children, as 99 (31.2%) had 4 or less children, 129 families (40.7%) had 5-7 children, and 89 families (28.1%) had 8 or more children. Two hundreds and four children (64.4%) lived in the city, 80 (25.2%) lived in refugee camps, and 33 children (10.4%) lived in villages.

The majority of families (188, or 59.3%) had a very low monthly income of less than $289, 67 families (21.1%) had an income of $ 290-481, 38 families (12%) had a monthly income of more than $ 482-722, and 24 families (7.6%) had a monthly income of more than $ 723 (Table 2).

Types and Severity of Traumatic Events

As shown in Table 3, Palestinian children were exposed to a variety of traumatic events ranging from 0-28 traumatic events, each child reported experiences of 9.34 traumatic events (SD=4.88).
Table 2: Sociodemographic Characteristic of the Study Sample (N=317).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>161</td>
<td>50.8</td>
</tr>
<tr>
<td>Female</td>
<td>156</td>
<td>49.2</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>aged from 9-16 years with mean age 12.51 (SD=2.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place of residence</td>
<td></td>
<td></td>
</tr>
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<td>City</td>
<td>204</td>
<td>64.4</td>
</tr>
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<td>Camp</td>
<td>80</td>
<td>25.2</td>
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<tr>
<td>Village</td>
<td>33</td>
<td>10.4</td>
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<tr>
<td>No of siblings</td>
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<td></td>
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<td>4 and less</td>
<td>99</td>
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<td>5-7 siblings</td>
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<td>8 and more siblings</td>
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<tr>
<td>Less than $289</td>
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<td>59.3</td>
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<td>$290-481</td>
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<tr>
<td>$482-722</td>
<td>38</td>
<td>12.0</td>
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<tr>
<td>More than $723</td>
<td>24</td>
<td>7.8</td>
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</table>

Table 3: Types of Traumatic Events.

<table>
<thead>
<tr>
<th>Trauma</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing shelling of the area by artillery</td>
<td>285</td>
<td>89.9</td>
</tr>
<tr>
<td>Watching mutilated bodies in TV</td>
<td>285</td>
<td>89.9</td>
</tr>
<tr>
<td>Hearing the sonic sounds of the jetfighters</td>
<td>269</td>
<td>84.9</td>
</tr>
<tr>
<td>Witnessing the signs of shelling on the ground</td>
<td>227</td>
<td>71.6</td>
</tr>
<tr>
<td>Witnessing assassination of people by rockets</td>
<td>164</td>
<td>51.7</td>
</tr>
<tr>
<td>Hearing killing of a close relative</td>
<td>152</td>
<td>47.9</td>
</tr>
<tr>
<td>Deprivation from water or electricity during detention at home</td>
<td>150</td>
<td>47.3</td>
</tr>
<tr>
<td>Witnessing of a friend home demolition</td>
<td>121</td>
<td>38.2</td>
</tr>
<tr>
<td>Hearing killing of a friend</td>
<td>116</td>
<td>36.6</td>
</tr>
<tr>
<td>Witnessing firing by tanks and heavy artillery at neighbours homes</td>
<td>112</td>
<td>35.3</td>
</tr>
<tr>
<td>Being detained at home during incursions</td>
<td>98</td>
<td>30.9</td>
</tr>
<tr>
<td>Witnessing of own home demolition</td>
<td>79</td>
<td>24.9</td>
</tr>
<tr>
<td>Threaten by shooting</td>
<td>76</td>
<td>24.0</td>
</tr>
<tr>
<td>Threaten by telephoned to evacuate your home before bombardment</td>
<td>71</td>
<td>22.4</td>
</tr>
<tr>
<td>Witnessing firing by tanks and heavy artillery at own home</td>
<td>65</td>
<td>20.5</td>
</tr>
<tr>
<td>Witnessing arrest or kidnapping of someone or a friend</td>
<td>64</td>
<td>20.2</td>
</tr>
<tr>
<td>Witnessing shooting of a friend</td>
<td>61</td>
<td>19.2</td>
</tr>
<tr>
<td>Deprivation from going to toilet and leave the room at home where you was detained</td>
<td>54</td>
<td>17.0</td>
</tr>
<tr>
<td>Witnessing killing of a friend</td>
<td>53</td>
<td>16.7</td>
</tr>
<tr>
<td>Witnessing shooting of a close relative</td>
<td>51</td>
<td>16.1</td>
</tr>
<tr>
<td>Destroying of your personal belongings during incursion</td>
<td>47</td>
<td>14.8</td>
</tr>
<tr>
<td>Witnessing killing of a close relative</td>
<td>45</td>
<td>14.2</td>
</tr>
<tr>
<td>Shooting by bullets, rocket, or bombs</td>
<td>44</td>
<td>13.9</td>
</tr>
<tr>
<td>Beating and humiliation by the army</td>
<td>43</td>
<td>13.6</td>
</tr>
<tr>
<td>Threatened to death by being used as human shield to arrest your neighbours by the army</td>
<td>34</td>
<td>10.7</td>
</tr>
<tr>
<td>Physical injury due to bombardment of your home</td>
<td>32</td>
<td>10.1</td>
</tr>
<tr>
<td>Threaten of family member of being killed</td>
<td>26</td>
<td>8.2</td>
</tr>
<tr>
<td>Threaten of being killed</td>
<td>25</td>
<td>7.9</td>
</tr>
</tbody>
</table>
The most common traumatic experiences were hearing shelling of the area by artillery (89.9%), watching mutilated bodies in TV (89.9%), Hearing the sonic sounds of the jet fighters (84.9%), and witnessing the signs of shelling on the ground (71.6%). While the least common traumatic events were threatening family members of being killed (8.2%), and threatened of being killed (7.9%).

Sociodemographic Differences and Exposure to Traumatic Events

In order to investigate the sex differences between boys and girls in reporting traumatic experiences, independent t-test was performed. The results showed that boys were exposed to more traumatic events than girls (mean=9.9 vs. mean=8.76). This was statistically significant ($p=0.03$). The results showed that older age group children (13-16 years) were exposed to more traumatic events than the younger age group. This was statistically significant ($p=0.001$).

Type of Post-Traumatic Stress Reactions

Among Palestinian children, the most commonly reported post-traumatic stress reactions were loss of interest in significant activities (64.7%), sleep disturbance (51.7%), avoidance of reminders (47.6%), intrusive images and sounds (43.3%), and difficulty in concentrating (43.2%).

Severity of Post Traumatic Stress Reactions

Children’s post-traumatic stress reactions scores ranged between 5 and 59. Mean CPTSD-RI was 31.15 (SD=11.66). Intrusion subscale mean was 11.19 (SD=5.4), avoidance subscale mean was 7.21 (SD=3.73), and hyperarousal subscale mean was 7.68 (SD=3.46). Twenty one (6.6%) children reported no post-traumatic stress reactions, 69 (21.8%) reported mild post-traumatic stress reactions, 147 (46.4%) reported moderate post-traumatic stress reactions, and 80 (25.2%) reported severe to very severe post-traumatic stress reactions. Using cut-off point of 40 and more as PTSD, 25.2% of children met the diagnosis of PTSD and 74% had no PTSD.

Sociodemographic Differences on Severity of Post-Traumatic Stress Reactions

There were statically significant sex differences in developing post-traumatic stress reactions in which girls developed more PTSD than boys ($\chi^2=14.19$, d.f.=3, $p<0.003$). The results showed than girls significantly developed more PTSD than boys (Mean=33.58 vs. 28.79), also more girls developed intrusion symptoms than boys (mean=12.10 vs. 10.31), avoidance symptoms (mean=8.21 vs. 6.3), and also hyperarousal was more in girls (mean=8.05 vs. 7.32). The results showed that older age group children (13-16) developed PTSD more than the younger age group. This was statistically significant ($t=-2.20$, $p=0.01$).

Also, the older group developed intrusion symptoms more than the younger age group ($t=-2.49$, $p=0.01$) and hyperarousal symptoms ($t=-2.18$, $p=0.03$). However, no age differences was observed for avoidance symptoms.

Anxiety Symptoms

Addressing the anxiety symptoms reported by children, 59.6% said that they are worried that something awful will happen to someone in their families, (56.2%) have to think of special thoughts to stop bad things from happening (like numbers or words), and they are proud of their school work (51.4%).

Means and Standard Deviations of Anxiety Disorders in Children

Children recorded from 0-114 symptoms of anxiety, total score of anxiety was 41.15 (SD=20.02), obsessive compulsive disorder mean was 8.4 (SD=3.4), social phobia 7.3 (SD= 4.1), generalized anxiety mean was 6.7 (SD=4), separation anxiety mean was 6.5 (SD=4.2), physical injury fears was 5.3 (SD=4.2), panic/agoraphobia was 7 (SD=5.4).

Sociodemographic Differences in Anxiety of Children

The results showed that girls showed more total anxiety score ($t=-7.74$, $p=0.001$), girls also experienced more panic/agoraphobia ($t=5.32$, $p=0.001$), and more separation anxiety ($t=-7.92$, $p=0.001$), than boys, however no differences were observed for obsessive compulsive disorder ($t=0.38$, $p=ns$). The results showed that children aged between 9-12 years showed more panic/agoraphobia than children aged between 13-16 years ($t=2.5$, $p=0.01$), physical injury fears were more in children aged between 9-12 years relative to other age groups ($t=2.52$, $p=0.01$), social phobia were also more in children aged between 9-12 years than the older age group ($t=3.07$, $p=0.002$), obsessive compulsive disorder was more in children aged between 13-16 years relative to the younger age group ($t=2.88$, $p=0.004$), however no differences were observed in anxiety, separation anxiety, or generalized anxiety.

Prevalence of General Mental Health Problems Using SDQ

Using SDQ for self, 19.4% of the children rated themselves as having caseness (were considered as having a problem), 4.7% of them were hyperactive, 9.9% had emotional problems, 40.3% had conduct problems, and 18.5% had peer problems.

Using SDQ for parents, 24.3% of the children were rated as having caseness (were considered as having a problem), 6.3% of them were hyperactive, 19.9% had emotional problems, 53.3% had conduct problems, and 27.8% had peer problems. Using SDQ for teachers, 28.4% of the children were rated as having caseness (were considered as having a problem), 3.8% of them were hyperactive, 7.8% had emotional problems, 47% had conduct problems, and 21.2% had peer problems.
Sociodemographic Differences in SDQ Scores

The results showed that girls showed more mental health problems than boys according to their teachers (mean=13.9 vs. mean=11.9) ($t$=-3.2, $p=0.01$). There were no sex differences in rating mental health problems by themselves and their parents.

Types of Coping Strategies

Children used a variety of coping strategies. The most common coping strategies used by children were: 71.6% of children said they go along with their parents and rules, 64.1% try to improve themselves (get body in shape, get better grades, etc.), 64.1% of them pray, 59.9% work hard on schoolwork or other school projects, 52.8% do things with their family. While the least common coping strategies used were: drinking beer, using sedatives (4.6%) and smoking (3.1%).

Means and Standard Deviation of Coping Strategies

Children used a group of coping strategies to overcome trauma and stress, mean total ACOPE was recorded as 187.5 (SD=21.3), while the highest subscale of coping was for seeking professional support (mean=36.6, SD=1.4), seeking diversion (mean=22.7, SD=5.4), solving family problems (mean=20.9, SD=4.9), developing social support (mean=19.2, SD=4.2), developing self-reliance (mean=18.4, SD=4.7), ventilating feelings (mean=15.7, SD=3.8), engaging in demanding activities (mean=14.3, SD=3.1), relaxing (mean=10.3, SD=3.3), seeking spiritual support (mean=10.1, SD=3.0), avoiding problems (mean=8.1, SD=3.3), being humorous (mean=5.9, SD=1.8), and investing in a close friend (mean=5.8, SD=2.3) (Table 4).

Sociodemographic Differences in Coping Strategies

The results showed that boys generally cope better than girls ($t$=2.12, $p=0.04$). Boys also seek diversion more than girls ($t$=3.84, $p=0.001$), and seek spiritual support ($t$=6.98, $p=0.001$).

Relationship between Traumatic Events and Child Mental Health Problems

To test the hypothesis underlying the relationship between violent (traumatic events) and mental health in children, correlation coefficient test was performed using the Pearson correlation. The results showed that there was a strong association between trauma and total scoring of mental health problems by teachers ($r=0.13$, $p=0.04$). There was an association between trauma and mental health problems rated by the children themselves ($r=0.15$, $p=0.03$) (Table 5).

| Table 4: Means and Standard Deviation of Coping Strategies. |
|---------------------------------|--------|-------|
| Coping                        | Mean   | SD    |
| Total ACOPE                   | 187.5  | 21.4  |
| Seeking professionals support | 36.6   | 1.4   |
| Seeking diversion             | 22.7   | 5.4   |
| Solving family problems       | 20.9   | 4.9   |
| Developing social support     | 19.2   | 4.2   |
| Developing self-reliance      | 18.4   | 4.7   |
| Ventilating feelings          | 15.7   | 3.8   |
| Engaging in demanding activities | 14.3  | 3.1   |
| Relaxing                      | 10.3   | 3.3   |
| Seeking spiritual support     | 10.1   | 3.0   |
| Avoiding problems             | 8.1    | 3.3   |
| Being humorous                | 5.9    | 1.8   |
| Investing in close friend     | 5.8    | 2.3   |

| Table 5: Pearson Correlation Coefficient test between Trauma and SDQ. |
|---------------------------------|--------|
| Variables                      | R      |
| SDQ total -teachers            | 0.13*  |
| SDQ total-parents              | 0.09   |
| SDQ total-self                 | 0.15*  |

*p<0.05, **p<0.01, ***p<0.001, p>0.05
Relationship between Trauma, Anxiety, General Mental Health, PTSD, and Coping Strategies

To test the hypothesis underlying the relationship between PTSD and coping strategies used by children to overcome violence and related consequences, correlation coefficient test was performed using Pearson correlation. The result showed that there was a strong association between total traumatic events and PTSD ($r=0.14$, $p=0.01$) (Table 6).

Total PTSD was correlated with total anxiety ($r=0.40$, $p=0.001$), ventilating feelings ($r=0.27$, $p=0.01$), developing social support ($r=0.14$, $p=0.01$), avoiding problems ($r=0.21$, $p=0.01$), and being humorous ($r=0.12$, $p=0.01$).

Total anxiety was correlated with total coping ($r=0.15$, $p=0.001$), total PTSD ($r=0.40$, $p=0.001$), ventilating feelings ($r=0.27$, $p=0.01$), developing social support ($r=0.27$, $p=0.01$), and relaxing ($r=0.17$, $p=0.01$).

Prediction of PTSD by Traumatic Events by Political Violence

In order to test the predictive value of specific traumatic events on PTSD symptoms, total CPTSD-RI was entered as the dependent variable in logistic regressions, with 28 types of traumatic events as the covariates. The event that was significantly associated with PTSD was beating and humiliation by the army ($\beta=0.16$, $p=0.01$), witnessing arrest of someone or a friend ($\beta=0.14$, $p=0.01$) ($F=7.12$, $p=0.001$) (Table 7).

Prediction of Mental Health Problems Due to Political Violence

In order to investigate the relative predictive value of trauma on the development of different mental health problems, a series of linear regression analyses were performed. Total traumatic events were entered as the dependent variable, and mental health problems, PTSD, and anxiety, as independent variables.

The results showed that traumatic events were predic-
tive of mental health problems, number of traumatic events and hyperactivity by teachers ($\beta = 0.19$, $t = 3.4$, $p < 0.01$). General mental health problems rated by teachers ($\beta = 0.14$, $t = 2.5$, $p < 0.01$), general mental health problems rated by children ($\beta = 0.14$, $t = 2.1$, $p < 0.05$), PTSD also was predicted by traumatic events ($\beta = 0.39$, $t = 7.5$, $p = 0.01$). However, traumatic events were negatively predictive of social problems rated by children themselves ($\beta = -0.14$, $t = -2.0$, $p < 0.05$) (Table 8).

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>$\beta$</th>
<th>$R^2$</th>
<th>$t$</th>
<th>$F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyperactivity-teachers</td>
<td>0.19</td>
<td>0.03</td>
<td>3.4**</td>
<td>11.7**</td>
</tr>
<tr>
<td>SDQ total-teachers</td>
<td>0.14</td>
<td>0.02</td>
<td>2.5**</td>
<td>6.5**</td>
</tr>
<tr>
<td>Social problems-self</td>
<td>0.14</td>
<td>0.02</td>
<td>-2.0*</td>
<td>4.2*</td>
</tr>
<tr>
<td>SDQ total-self</td>
<td>0.14</td>
<td>0.02</td>
<td>2.1*</td>
<td>4.5</td>
</tr>
<tr>
<td>PTSD</td>
<td>0.39</td>
<td>0.15</td>
<td>7.5**</td>
<td>**57.5</td>
</tr>
</tbody>
</table>

*p<0.05, ** p<0.01, *** p<0.001, p=0.05

**DISCUSSION**

In our study each Palestinian child was exposed to 9.34 traumatic events due to political violence and the most common traumatic experiences were hearing shelling of the area by artillery, watching mutilated bodies in TV (89.9%), hearing the sonic sounds of jet fighters, and witnessing the signs of shelling on the ground. This is similar to our study of children in North Gaza and Middle area after incursion.20,31-36

Bosnian children reported other types of traumatic events such as separation from parents, death of parents or siblings, and extreme poverty or deprivation.3 From the above mentioned studies, we can conclude that each culture and area may need a certain measure of exposure to trauma in order to adapt to the type of conflict and the involvement of children and their families. Our study showed that boys were exposed to more traumatic events than girls due to political violence. This finding concerning the risks of trauma in boys was consistent with the previous studies in the Gaza Strip.31,32,35,37 This high exposure was attributed to cultural factors in which boys moved aside during incursions and bombardment and witnessed the remnant of the martyrs in the streets. While Palestinian girls are protected and kept at home and not allowed going outside the home. Our results showed that older age group children (13-16 y) were exposed to more traumatic events than the younger age group. This due to the fact that the young children are kept at home with their parents and the older children are more active outside their homes. The strong association established between traumatic events and severity of PTSD reactions support the linear relationship between trauma and PTSD in children. Our findings were congruent with those of the previous studies.35,37 Our study showed that the rate of PTSD was 25.2%. This rate was less than the studies done in the north and the middle area of the Gaza Strip in which 71% of the children were considered to be suffering from PTSD.31 Our results were consistent with the results of the study on of children and adolescents aged between 8-16 years in Gaza and the West Bank. The frequency of PTSD scores above the established cut-off score (likely PTSD) was 21.2%. There was significant association between exposure to traumatic events and PTSD symptoms.32

This study showed that girls developed more PTSD than boys. This is consistent with the results from similar studies in other parts of the world.8,21,38,39 However, the results showed that older age group children (13-16 y) developed more PTSD than the younger age group thus, more intrusion, and hyper-arousal symptoms. These findings have been replicated in other cultural groups.40 This was inconsistent with the results our previous study on the effect of shelling in children.31,35,36

According to this study, the prevalence of mental health problems rated by teachers and parents were less than previously recorded rates in the study in of the children (38.5%) from Gaza were rated as having caseness by teachers and (36.9%) by parents.20

Girls reported more mental health problems by themselves than boys. Children aged between 13-16 years reported more mental health problems by themselves than the younger age group.

Anxiety disorders represent one of the most common forms of child psychopathology. The children’s total score of anxiety was 41.15, obsessive compulsive disorder mean was 8.4, social phobia 7.3, generalized anxiety mean was 6.7, separation anxiety mean was 6.5, physical injury fears was 5.3 and panic/agoraphobia was 7. The present study was consistent with the study of labor children in the Gaza Strip in which the mean total anxiety score was recorded as 48.15.27 Our results were inconsistent with study of a community sample of 2,052 children between 8-12 years of age. Lower scores of total anxiety and other were reported.23 Our results were consistent with the study on the effect of home demolition of Palestinian anxiety; they found that children whose homes were demolished showed significantly more psychological symptoms than the children in witness control groups. The age of children was not significantly related to
The children mean total coping strategies was 187.5 for children, while the highest subscale of coping was towards seeking professional support, seeking diversion, solving family problems, developing social support. The results showed that boys generally cope better than girls, boys also seek diversion more than girls, and seek spiritual support. The results showed that there was a strong association between PTSD and total coping strategies, ventilating feelings and PTSD, social support and PTSD, avoiding problems and PTSD. Our results were consistent with the previous studies in the Gaza Strip.\(^{30,32,34,43}\) Our results were inconsistent with the results that found children used instrumental social support (81.2%), instrumental emotional support (75.9%), religious coping (59.8%), and humor (50.8%).\(^{44}\) Also, others found that a majority of the children's coping responses in the study of stressors and coping behaviors of school-aged homeless children staying in shelters were in the social support (86%), cognitive avoidance (38%), and behavioral distraction categories (31%). While 17% were in the cognitive restructuring category, 14% in information seeking category, 10% in isolating activities and 3% in seeking spiritual support.\(^{45}\) Also, the results of the study on adolescents who reported coping strategies among two groups were exposed to different stressors; the groups of different stressful situations have indicate 55% active coping, 19.29% distraction, 27.11% avoidance, 17.97% support-seeking, and social support 18.64%.\(^{46}\) The study showed that adolescents who experienced traumatic experiences developed less social support and positively asked for more professional support as coping strategies. Adolescents with PTSD had showed coping by ventilating feelings, developing social support, avoiding problems, and adolescents with less PTSD were more focussed towards solving their family problems. Adolescents with anxiety were associated with ventilating feelings, developing social support, and engaging in demanding activities. Adolescents with less anxiety were seeking more spiritual support. Such findings were consistent with the previous studies in the area.\(^{32-34}\)

CONCLUSION

The study showed that Palestinian children were exposed to 9.34 traumatic events due to political violence. Boys and older age children were more traumatized. There was a strong association between traumatic events and the severity of PTSD reactions. Girls showed more PTSD than boys and older age group children developed more PTSD than the younger age group. Our study showed that prevalence of general mental health problems using SDQ by children aged 11 years and more using SDQ for self, parents and teachers (19.4%, 24.3%, and 28.4% of children respectively were rated as having caseness). Anxiety disorders represent one of the most common forms of child psychopathology. The results showed that girls showed more total anxiety. Palestinian children used a group of coping strategies to overcome trauma and stress, the highest subscale of coping was seeking professional support, seeking diversion, solving family problems, developing social support, developing self-reliance, ventilating feelings, engaging in demanding activities, relaxing, seeking spiritual support, avoiding problems, being humorous, and investing in close friend. The result showed that there was a strong association between PTSD and total coping strategies, ventilating feelings and PTSD, social support and PTSD, avoiding problems and PTSD.

Clinical Implications

The finding of this study highlighted the need to establish outreach child mental health clinics with multidisciplinary staff at primary health centers to assess and treat children referred from community agencies and schools after exposure to traumatic events. Also, continuous training programmes conducted by child mental health professionals for primary health physicians and nurses, in order to enable those professionals to diagnose children with PTSD and other psychiatric disorders, and to manage less complex cases at the primary care level. School-based prevention and treatment programmes need to be developed and supported, as schools provide access to a developmentally appropriate environment that encourages normality and minimizes stigma. School is also a setting in which PTSD and associated symptoms are likely to emerge.

ACKNOWLEDGMENT

We appreciate the support given by World Vision Australia to conduct this study, to children, families, and teachers participating in this study.

CONFLICTS OF INTEREST

There were no conflicts of interest in conducting this study.

AUTHORS’ CONTRIBUTIONS

This work was carried out in collaboration between both au-
thors. Authors AMT designed the study and wrote the protocol. Author SST performed the data collection, statistical analysis and managed the literature search. Author AMT wrote the first draft of the manuscript with the author’s assistance. Both the authors read and approved the final manuscript.

REFERENCES


Binary and Ternary Analogy by Children: Testing the Role of Insufficiently Developed Working Memory Capacity (WMC) Executive Functions

Stephen Ntim, PhD, MPhil, MA, BEd; Mavis Okyere, MPhil, BEd

Faculty of Education, Catholic University of Ghana, P.O. BOX 363, Sunyani, Fiapre, Ghana

ABSTRACT

Background: Ghanaian classroom teachers face consistent challenges asking children to relate classroom interactions with the development of connected thinking in areas such as mathematical proficiency and reading comprehension. Inculcating inference-making ability in children places a cognitive burden on the executive control of the working memory capacity (WMC). Therefore, the purpose of this study was to examine the relationship between WMC and executive function, with specific reference to how inhibition as executive control influenced active retrieval and goal maintenance in the context of analogy distraction making.

Method: Two hundred and eighty-nine kindergarten and primary school children aged between 3-11 years participated in this study. Subjects were tested on four variables on binary and ternary analogy making with distractions.

Results: Even younger children were capable of attending to and making mapping relations. However, they were less likely to overcome misleading object surface similarity and to maintain relational structure especially when an additional level of complexity was imposed.

Conclusion: This was attributed to insufficiently develop executive function constraints, especially inhibition, which was identified as the predicting cause of children’s difficulty in binary and ternary analogies.

KEY WORDS: Analogical reasoning; Relational complexity; Error pattern.


INTRODUCTION

Problem-solving along with innovative and adaptive thinking have been perceived to be the core attributes of this millennium. This is largely due to the fact that contemporary global demands from the labor market are increasingly becoming more complex unlike the recent past. The implication is that job recruitments require complex skills, for which children today can no longer be taught with the teacher-centered, lecture approach methods which often fail to assist children to be critical thinkers, problem solvers, innovative and inductive reasoners, or generate hypotheses and test them in order to discover new knowledge. Thus, the knowledge required to drive the present job market is one that has the following two fundamental attributes: a) Knowledge that is essentially inductive and analytical in reasoning; b) Knowledge that supports formulating hypothesis and drawing plausible inferences. This ability to reason analogically, to be creative and adaptive and the ability to exhibit a general intelligence constitutes the hallmark of the human species as compared to the chimpanzee. This fact supports the possibility that one can apply one’s knowledge in different contexts. In this respect, helping children to develop analogical thinking is critical especially when many classroom teachers generally have consistent challenges asking children to link classroom interactions to develop...
connected thinking.

Theoretical Framework/Literature Review

What is an Analogy?

The English word analogy is derived (from Greek word ἀναλογία, analógia, “proportion”). It is a cognitive process by which information or meaning is transferred from a particular base (the analogue or source) to another (the target), or a linguistic expression corresponding to such a process. It has been perceived to be at the nucleus of human cognition. In this respect, analogy-making can be defined as the ability to see two or more non-identical objects or situations as being the ‘same’ at some level of abstraction. For instance, analogy-making is central to teaching students concept formation, categorization and recognition, especially in subject areas such as mathematics, science, and reading comprehension. Children learn to recognize examples of categories such as ‘dog’ or ‘cat’. Even though different dogs often look very different from each other, yet, these differences notwithstanding, children perceive some essential sameness at an abstract level and can differentiate a dog from a cat. Similarly, children not only learn to recognize cats and dogs in books but also in real life, even though on the surface, such images are very different from one another and from the corresponding real-life creatures. Hofstadter explained that even the ability to recognize the letter ‘A’ in many different type faces and handwritings requires a highly sophisticated analogy-making ability.

Theoretically, an analogy could be conceived as a general cognitive ability of transferring knowledge from a source (a base) to a target. In this sense, it helps people to close a representational gap in a new task (target) by transferring relevant elements from a familiar task referred to as source. Almost three decades after Gentner began pioneering theoretical work in this area, many empirical studies have been conducted including computational models at the beginning of this millennium. Gentner consistently highlighted the critical role of relational structure between target and source rather than surface similarities. Empirical findings in analogy making suggest that individual differences exist in both analogy inference and general abstract reasoning. Over the years, testing analogical reasoning was considered one of the best measures of general mental ability (the g factor).

Theories of Analogical Development

Piaget and collaborators were among the pioneers to conduct studies on analogies. Their findings showed that children below 7-years were more likely to make more errors on formal analogies when they had some knowledge of relations; b) The relational shift hypothesis of analogical reasoning contends that before a certain level of development is achieved, children tend to focus on surface similarity between objects. It is only after this age, that analogical reasoning is assumed to be based on relational features; and c) The relational complexity hypothesis of analogical reasoning mentions that changes in analogical-naming are contingent upon working memory capacity (WMC) constraints. It is these constraints that influence whether or not children are able to process multiple relations simultaneously.

Working Memory Capacity Constraints: Relational Complexity

This third explanation for developmental changes in analogical reasoning puts a premium on the constraints of children’s working memory capacity within the context of relational complexity. Authors such as perceived this relational complexity in terms of the quantum or number of related variations that need to be processed in parallel. For example, there are different kinds...
of mapping based on the number of relations. Unitary relations are predicates having only one argument. This corresponds to Gentner’s terms. Mapping, in this case, is based on one-place and predicates are validated by attribute similarity. This type of mapping is called relational mapping which is based on a two-dimensional structure, such as, A:B::C:D or Woman:Baby:: Mare:Foal. The validation here is by similar relation, namely, mother of in source and target. In addition to relational mapping, there is also system mapping. In this case, elements are mapped to ternary relations. At this level, there need not be any resemblance between the binary relations in the structures. In this respect, system mapping allows for a high degree of flexibility and abstraction. The reason for this high degree of flexibility and abstraction is that they could be used to establish correspondences between structures that have only format similarities. Additionally, this high level of flexibility and abstraction permit analogies to be recognized, but this recognition of analogies is obtained at the cost of higher information processing loads. Moreover, there are also multiple systems mapping which is based on a four-dimensional structure.

Linsey at al examined some examples of these different types of mapping. For instance, they see a binary relation as one between two arguments, both of which are sources of variation. Thus, ‘boy chases girl’ specifies a single relation (chase) between two arguments (boy and girl). Similarly, a ternary relation includes three arguments as sources of variation as ‘mom chases boy who chases girl.’ It is on the basis of such metric relational complexity, that Halford made a case for a developmental continuum in children’s working memory capacity. This author’s contention is that children are capable of processing binary relations (a relation between two objects) after 2 years of age, whereas ternary relations could be processed after 5 years. Other authors using the same relational complexity metric, but with some nuances in the context of ‘cognitive complexity and control theory’, have also identified similar age related developmental progressions. The difference between the present authors thinking and those mentioned above is that complexity is not defined in terms of numbers of relations or the number of hierarchical rules that children need to be able to accomplish a given task. For example, research has shown that 3- and 4-year-olds were more successful in performing separate sorting tasks than when they were required to switch between tasks, thus integrating these tasks with a higher order rule. It is based on such empirical findings that some researchers make the hypothesis that change with age is a function of children’s development of executive function and particularly their ability to perceive the relation between two rules in order to develop and use a higher order rule that integrates the rule pair.

Working Memory Capacity and Executive Control

Working memory is a core concept for many theories of control of thought and action in cognitive psychology. Notwithstanding the disagreement among researchers regarding its specific definition, the working memory system is typically viewed as the cognitive architecture responsible for active maintenance and manipulation of information over a brief time period. It is considered as a part of a larger memory architecture, where information is perceived, attended to, and retrieved. The central executive is responsible for controlled processing in working memory, including, but not limited to the following: a) Directing attention, b) Maintaining task goals, c) Decision making, and d) Memory retrieval. Notably, other models of working memory also posit a central executive, or a common attention control mechanism similar to the central executive.

The above hypothesis of relational complexity is closely linked with working memory and executive control that is also recognized in the literature. In other words, there is a link between WMC and the efficacy of executive control (EC). WM is a relatively basic (in comparison to reasoning) cognitive mechanism responsible for the active maintenance of information to promote its ongoing processing. Working memory capacity is usually defined as the maximum number of items (a span) that can be recalled or recognized immediately after a WM task. According to relational complexity theory, the representation of a relation (conceptualized as a tensor product relational symbol and its arguments) grows exponentially as the number of interacting variables (i.e., vectors) needed to be processed in parallel rises, resulting in a decrease in processing accuracy.

In this respect, perceived high-WMC individuals should be able to process more complex analogies, as their more capacious WM allows for more bindings (i.e., tensor products of more vectors) than does the WM of low-WMC individuals. To establish a relation between the representations, direct access to corresponding memory chunks is required; so WMC, operationalized as the number of chunks that can be directly accessed, provides a possible constraint on reasoning processes. Another model explaining individual differences in analogical reasoning focuses on the constraints on one’s ability to control one’s cognitive processing. In instructional psychology, this is similar to cognitive strategies that are self-management strategies to distinguish between relevant and irrelevant information. Executive control is assumed to be responsible for the organization and co-ordination of these types of mental states and processes in accordance with the internal goals of an individual. The main functions of executive control in this type of cognitive process include active retrieval and maintenance of a goal in the face of distraction and interference, the updating of information actively held in the working memory, the inhibition of inadequate responses, and the capacity to shift between tasks. Considerable numbers of studies have shown that such processes significantly correlate with reasoning.

Present Study

The underlying phenomenon assumed to implicate children’s analogical inference from the above literature review is associated with the following: a) Increased domain knowledge, b) Relational shift, c) Relational complexity; and d) As a correlate to this third model, the link between working memory and executive control. The purpose of this study is to investigate this
fourth dimension, namely, to measure the relationship between WMC and executive function with specific reference to the extent to which executive control, especially inhibition, influence active retrieval and goal maintenance in the context of analogy distraction and interference. In this study, we take the position that there is a common attention control factor that underscores executive control and WMC (analogy) tasks, even though, these different analogy tasks are also likely to be induced by specific abilities tied to a developmental age factor. Consequently, this study validates the hypothesis that for older age groups (9-11) as compared to younger ones, (3-7) there would be a significantly higher number of correct responses for ternary analogies. This hypothesis is based on empirical studies that show that younger children below the age of five were more successful in performing tasks separately or serially, but performed poorly when asked to switch between tasks to integrate tasks with higher order rules.25-29

RESEARCH METHODOLOGY

Sample

This study was performed using the purposive experimental sampling design from an estimated 289 kindergarten and primary school children aged between 3-11 years. These were randomly selected from four communities in two out of the ten administrative regions of Ghana: The Ashanti and the Brong Ahafo regions. In the Ashanti region, one hundred and forty-four children from two kindergarten and two primary schools were selected from the Kumasi Metropolis and Nkawie districts. In the Brong Ahafo region, another 145 children were sampled from another two kindergartens and two primary schools from Berekum and the Sunyani municipalities. The various age groups were in the following categories: There were ninety-six 3-4 year old children, there were ninety-eight 5-8 year old children and ninety-five 9-11 year old children. Participants were equally divided by sex. The demographic data of these children (not tabled here) mostly belonged to civil service, working class, self-employed, and farming parental backgrounds. Children recruited from Sunyani, Berekum, and Nkawie were all Ghanaians, whereas few of the children from the Kumasi Metropolis were of Lebanese and Nigerian parentage. All these children and their parents considered English as their second language. This study met all the specific requirements of the Faculty of Education of the Catholic University of Ghana’s Institutional Review Board regarding ethical considerations in research. All children voluntarily participated after parental consent.

MATERIALS AND DESIGN

This study tested the sampled children on the basis of the following two measures: a) Relational complexity with specific reference to binary; and b) Ternary relations in scene analogy. They were tested on different scene analogies that involved fruits, animals, inanimate objects, and humans. All these were assumed to be familiar to the children selected for this study. The analogies were varied in four ways: a) The number of examples of relevant relations that needed to be mapped either in binary or ternary analogies were varied. The aim was to understand how these children would be able to figure out the correct inference from base analogy to target notwithstanding some distracters. For example, in a one-relation analogy, there is an inactive object (dog) watching a cat chasing a mouse. In the two-relation, on the other hand, the dog now becomes active by joining the cat to chase the mouse; b) As a control measure to ensure that the children’s thought control processes within the WMC executive functions (especially inhibition) was on course, distractors and non-distractors such as a long pole were also included. For instance, extra objects that were either similar or dissimilar were made a part of the items to be mapped in the source; c) To ensure reliability and validity of the experiment, distracters were varied as much as possible between inanimate objects and non-inanimate objects; d) The scene analogies contained additional items that did not indicate the relevant relations. For example a dad reading to the girl who is reading to a teddy bear. They were asked to map this to a target: Mom is reading to a boy who is reading to the doll. In this scene, there was also a duster which had nothing to do with the relations.

Experiment

This experiment used scene analogy problems to seek some answers to the two research questions of this study, namely:

1. How do difficulties in binary and ternary relations influence analogical reasoning among selected Ghanaian children?
2. Is analogical reasoning a function of the ability to integrate multiple relations, relational knowledge and inhibitory control over surface similarities?

Relations used in these scene analogies were assumed to be familiar to the children and used motional and other verbs known to them such as kiss, chase, feed.25-28 Moreover, objects used in the analogies were those known to school children in Ghana.

Procedure

The procedure was as follows:

a. Children were given papers in which two pictures had the same pattern taking place; b) Children were instructed to determine the action occurring in the two pictures, even if they looked very dissimilar; c) They were given some examples before starting the mapping. For instance, they were shown a picture on the top with a two-relational pattern: A dad reading to the girl who is reading to a teddy bear. They were asked to map this to a target: Mom is reading to a boy who is reading to the doll. In all, children were given ten pairs of similar scene analogies but eight (8) pairs of analogies were actually tested due to fatigue on the part of respondents. Each pair was given a raw score of 25 points,
RESULTS

The overall results in this experiment are suggestive of three fundamental factors as the underlying force of analogical reasoning among these selected children: a) Developmental age-related factor, b) The load of relational complexity; and c) The effect of distraction. As indicated in Table 1 above, the mean scores of the different age groups on the four variables were related to the number of analogies, the number of distractors, and age. Younger children aged between 3-4 years scored their highest mean of 50.84 (SD=2.564) when there was only one-relation with no distractors compared with their mean scores on one-relation with distracters of 33.94 (SD=2.508). The scores fell to 36.14 (SD=2.106) and 31.49 (SD=1.188) with a two-relation analogy with no distractors and a two-relation analogy with distracters, respectively. However, it was not exactly the same in the two other groups, namely 5-7 and 9-11 year age groups. Nevertheless, the scores of these two groups (that is 5-7 and 9-11) on one-analogy without distracters were relatively higher than their scores on two analogies without distracters. This seems to imply that the more the number of analogy, the lesser the scores. However, with the case of analogies with distracters, the pattern was not like that of the first group that is 3-4 year olds. Thus, for all the measures in the experiment, the underlying deciding factor that confirms the implication of analogical reasoning of these children whether in binary or ternary analogies, distraction and relational complexity, was undoubtedly the age factor.

Regarding the level of relational complexity (whether or not the analogy was binary or ternary), the data indicate that older children performed comparatively better when analogies were ternary than (compared to when they were binary) did younger children. For example, the 9-11 year olds on the measure of two-relation analogy with distracters performed relatively better with mean scores of 54.94 (SD=1.712), whereas 5-7 year olds scored 41.81 (SD=1.648) and 3-4 year group 31.49 (SD=1.188). On ternary analogies, any time there was a distracter, the means decreased for all groups. This suggests that the more complex the analogy with distracters, the lower the scores; and b) The less complex the relation with no distracters, the higher the scores across the three age groups as indicated in the scores in Table 1. We interpreted this to be the main effect of distraction which was also indicative of two key patterns: Indicating two error patterns: a) Substantial effect of relational complexity: The more complex the analogy with distracters, the lower the scores; and b) The less complex the relation with no distracters, the higher the scores across the three age groups as indicated in the scores in Table 1.

Distraction as shown in Table 1 was more potent for younger children than it was for older ones. For example, in two-analogy with distraction, 3-4 year olds scored a mean of 36.14 (SD=1.188) compared with 46.14 (SD=1.759) for 5-7 year olds and 62.20 (SD=1.265) for 9-11 year olds, respectively. To test whether there was a statistically significant difference between the mean scores of the different age groups on the four variables: One-relation analogy with no distracter, one-relation analogy with distracters, two- relation analogy with no distracter, and two-relation analogy with distracter, one-way analyses of variance (ANOVA) were used. The results, as shown in Table 2, indicated statistically significant differences among the performances of the three age groups on the four variables.

To determine the appropriate post-hoc test among the means of the three age groups, Levene’s test of equality of variances was computed and the results are shown in Table 3.

There was no statistical difference in variance with respect to performance on the first variable, namely, one-relation analogy with no distracter as indicated in the test for equality of variance shown in Table 3. Consequently, the variances were assumed to be equal, and so the Bonferroni post-hoc test was used.

![Table 1: Means of the Scores of the Different Age Groups on the Four Variables.](image-url)
Table 2: One Way Analysis of Variance on the Scores of the Different Age Groups on the four Analogies.

<table>
<thead>
<tr>
<th></th>
<th>Sum of squares</th>
<th>Df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scores on one-relation Analogy with no distractor</td>
<td>Between groups</td>
<td>24493.830</td>
<td>2</td>
<td>12246.915</td>
<td>2.117E3</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>1654.316</td>
<td>286</td>
<td>5.784</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>26148.145</td>
<td>288</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scores on one-relation Analogy with distractor</td>
<td>Between groups</td>
<td>15570.449</td>
<td>2</td>
<td>7785.225</td>
<td>1.738E3</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>1276.426</td>
<td>285</td>
<td>4.479</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>16846.875</td>
<td>287</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scores on two-relation analogy with no distractor</td>
<td>Between groups</td>
<td>33004.848</td>
<td>2</td>
<td>16502.424</td>
<td>5.410E3</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>872.440</td>
<td>286</td>
<td>3.050</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>33877.287</td>
<td>288</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scores on two-relation analogy with distractor</td>
<td>Between groups</td>
<td>26368.277</td>
<td>2</td>
<td>13184.139</td>
<td>5.603E3</td>
</tr>
<tr>
<td></td>
<td>Within groups</td>
<td>672.922</td>
<td>286</td>
<td>2.353</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>27041.204</td>
<td>288</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The post-hoc tests in Tables 4 and 5 indicated that the older group (9-11 year olds) scored significantly higher on all four variables compared to the other age groups. For instance, on ‘one relation analogy with no distracter’, the mean difference between the 9-11 year olds and the 3-4 year olds was 22.609, whereas between 9-11 year olds and 5-7 year olds, the difference is 10.208. The 5-7 year olds also did better on this variable than...
3-4 year olds. The mean difference was 12.401.

DISCUSSION

Critical to analogical reasoning undoubtedly, is the developmental age-related factor. However, this does not necessarily imply that younger children are less likely to reason analogically until adolescence. The data in the above experiment also suggest that even much younger children were able to do some of the less complex analogies except that they attended more too surface/featural distractions. This is a possible implication of WMC executive functions especially inhibition. Much younger children appeared to have been constrained mentally, especially in parallel processing, as a result of mental load. This in our view is interpreted as giving plausibility to the relational complexity theory with respect to the efficiency in processing mental load. The abysmal performance of much younger children in more complex analogies with distractions may have been precipitated by inhibitions which de facto suggest that the representation of a relation (conceptualized as a tensor product of relational symbol and its arguments) grows exponentially as the number of interacting variables (i.e., vectors) that need to be processed in parallel rises, thus resulting in a decrease in processing accuracy.

The findings of this study corroborate several recent research findings positing that, although knowledge of relations is necessary to do analogies, executive functions are also involved in solving analogical problems. Younger children in this study were familiar with the objects used in the analogy. Their decreased processing accuracy, however, could not be attributed to lack of domain knowledge. The more plausible explanation is likely to be due to insufficiently developed executive functions. This thesis confirms the findings of Thibaut, indicating that younger children’s difficulties with analogy making are due to insufficiently developed executive functions, specifically inhibition. Additionally, the findings of this paper also strengthen recent studies showing that these processes largely depend on working memory functions. Given the fact that older children perform better than younger ones in all of the measured variables, one can assume that the better performance of older children relative to younger children is due to better management of the working memory capacity. Thus, one can infer that the older one grows, the better the one develops WMC functions. Hence, older children process mental load more effectively than the younger ones.

The findings also confirm those research studies in the area of WMC that postulate the theory of the number of chunks that can be directly accessed. The number of variations provided possible constraints on reasoning processes. This implies that high-WMC individuals (typical with older children) should be able to process more complex analogies. This is because their more capacious WM allows for more bindings (i.e., tensor products of more vectors) than does the WM of low-WMC individuals (typically with much younger children). Moreover, findings by Kroger and Waltz support the idea that the ability to map multiple relations in an analogy is linked to working memory capacity and the prefrontal context. That idea is corroborated by the findings in this study. Thus, the increase in capacity to cope with relational complexity would be expected to lead to increased analogical ability. The findings in this study support this assertion in the sense that, decreased capacity to cope with relational complexity especially given two or more analogies, led to decreased analogical ability across the three age groups.

CONCLUSION

This study sought to seek answers to two questions: a) How do difficulties in binary and ternary relations influence analogy making among selected Ghanaian children; and b) Is analogical reasoning a function of the ability to integrate multiple relations, relational knowledge, and inhibitory control over surface similarities? The findings of this study provide support for the relational primacy hypothesis in analogical reasoning. That is, children have the capability to attend to and make mapping relations. However, they are less likely to overcome misleading object surface similarity and are also less likely to maintain relational structure, especially when an additional level of complexity is imposed. This underscores what has been established in other studies, namely that children can attend to any analogy provided it is within their knowledge base and working memory capacity, and not so much on age per se. Even though, some of the data in this study are consistent with the age-related factor as underscored many years back by Piaget, it is also evident from this study that besides the age-related factors, working memory capacity executive functions, such as inhibitory factors, including the level of development of certain parts of the brain also mediate analogy making. Therefore, in predicting analogical reasoning in children, WMC executive functions are also critical.

DEFINITION OF TERMS

WMC: Working Memory Capacity: A core executive function, of the cognitive system with a limited capacity and duration. It is responsible for the transient holding, processing, and manipulation of information.

Working Memory: It is the part of short-term memory which is concerned with immediate conscious perceptual and linguistic processing. In the area of computing, it is an area of high-speed memory used to store programs or data currently in use. Working memory is an important process for reasoning and the guidance of decision making and behavior.

EF: Executive Functions: It is also known as ‘cognitive control’ and ‘supervisory attentional system’ They are a set of cognitive processes-including attentional control, inhibitory control, working memory, and cognitive flexibility, as well as reasoning, problem solving, and planning -that are necessary for the cognitive control of attention, comprehension monitoring especially in parallel processing.

Inhibition: Inhibition in cognitive psychology refers to the mind’s
ability to tune out stimuli that are irrelevant to the task/process at hand or to the mind’s current state. Cognitive inhibition can be done either in whole or in part, intentionally or otherwise. Cognitive inhibition in particular can be observed in many instances throughout specific areas of cognitive science.

Parallel Processing: Parallel processing is a method of simultaneously breaking up and running program tasks on multiple microprocessors, thereby reducing processing time. Parallel processing may be accomplished via a computer with two or more processors or via a computer network. Parallel processing is also called parallel computing. It is used in cognitive psychology especially in information processing theory of learning to refer to the ability of simultaneously attending to multiple information (simultaneously in a given time) without losing track of thought and attention and in so doing saving resources in the working memory. This is opposed to serial processing where information is processed single by single and therefore spending more time and resources in the working memory.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES


Quality of Life (QoL) and Depression Among Children With End Stage Renal Disease Attending Hemodialysis Units in Gaza Strip

Abdel Aziz Mousa Thabet, MBChB, DPM, DCAC, PhD*; Joma W. Younis, RN, MCMH

*Emeritus Professor, Child and Adolescent Psychiatry, School of Public Health-Child, Institute-Gaza-Al Quds University, P.O.Box 5314, Palestine
E-mail: abdelazizt@hotmail.com

ABSTRACT

Aim: The aim of this study was to compare the quality of life (QoL) and depression among children with end-stage renal disease (ESRD) undergoing hemodialysis in the Gaza strip compared to the control group of children with chronic medical problems attending the same hospitals.

Methodology: The study sample consisted of children diagnosed with ESRD (N=47) and a control group of children with chronic medical problems attending the same hospitals (N=95). Data collection was performed using sociodemographic scale, medical status checklist, QoL questionnaire and the birleson depression self-rating scale (DSRS) in a face-to-face interview.

Results: The results showed that prevalence of depression reported in children with ESRD was 20.13% and for the control group was 12.63%. The study showed that the mean total QoL for end stage renal (ESR) failure was 48.98 relative to 52.75 SD for the control group. There were statistically significant differences in the QoL among the control group children. Physical functioning mean for ESR failure was 14.02% and for the control group was 21.24%. There were statistically significant differences in physical functioning for the group being studied. Emotional functioning for ESR failure was 14.04% and the control mean was 9.68%. There were statistically significant differences in emotional functioning in the control group. Social functioning mean in ESR failure was 9.96% and 8.32% for the control group. There were statistically significant differences in social functioning towards the ESR failure. School functioning mean in ESR failure was 11.38% and 12.77 % for the control group. There were statistically significant differences in school functioning in the control group.

Conclusion: The findings of the study showed that the ESRD have positive perceptions about their QoL (emotional, social), negative perception towards physical functioning and school, compared to the control group who have positive perception about physical functioning, school and their QoL and negative perception towards social and emotional functioning, and indicate a higher incidence of depression among ESRD relative to the control group.

KEY WORDS: Children; Depression; ESRD; QoL.

ABBREVIATIONS: QoL: Quality of Life; ESRD: End-Stage Renal Disease; DSRS: Depression self-rating scale; CKD: Chronic Kidney Disease; CRF: Chronic Renal Failure.

INTRODUCTION

According to the American Society of Nephrology, chronic kidney disease (CKD) has affected 5-10% of the world population and has become a global public health problem.1 CKD is an important health problem for adults as well as pediatric and adolescent populations. Now-a-days, the frequent use of conventional concepts such as morbidity, mortality, and life expectancy...
for the evaluation of public health, is not sufficient to assess the state of health and well-being. Replacing these concepts, the measurement of quality of life (QoL) was proposed as a more appropriate approach for the evaluation of health care services.\textsuperscript{2} Health-related quality of life (HRQoL) focuses only on the well-being of an individual, and refers to an individual’s satisfaction with his/her own present health state.\textsuperscript{3}

Comparisons of QoL and depression among end stage renal diseases (ESRD) children and non-ESRD children is an important health issue due to the higher reported rate of depression among these groups. Depression is the most common psychological problem encountered in patients with end-stage renal disease.\textsuperscript{5}

Hemodialysis is the most common form of renal replacement therapy (RRT), with over 75\% of ESRD patients being treated using this type of therapy.\textsuperscript{4} Hemodialysis is a technique implemented to mediate the removal of waste products such as creatinine, urea and free water from the blood during renal failure. Hemodialysis is one of the three renal replacement therapies (the other two being renal transplant and peritoneal dialysis).\textsuperscript{5,6} Stressors, including medication procedures, dietary constraints, fear of death, and dependency upon treatment, may affect the QoL and exacerbate the feeling of a loss of control.\textsuperscript{7} Depression is widely believed to be the most common mental health problem among patients with ESRD.\textsuperscript{8}

The prevalence of major depression in the general population is approximately 1.1\%-15\% for men and 1.8\%-23\% for women.\textsuperscript{9} However, the prevalence of major depression among ESRD patients is approximately 20\%-30\%, and it may be as high as 47\%.\textsuperscript{10} Some studies have indicated that moderate depressive syndromes are common in approximately 25\% of ESRD patients, and that major depression is common in 5\%-22\% of ESRD patients.\textsuperscript{11}

The aims of this study were 1) To compare the QoL and prevalence rate of depression among children with ESRD undergoing hemodialysis compare to the control group, 2) To examine the relationship between QoL and depression among ESRD children and non-ESRD children (control group) in relation to socio-demographic variables such as (age, gender, family income, place of residence, etc.) in the Gaza Strip hospitals.

METHOD

Participants

The study sample include all children (N=47) aged between 6-18 years, attending 4 hemodialysis centers in Gaza Strip, who have a medical record and are registered in the hospital of Ministry of Health as ESRD patients to receive regular hemodialysis sessions during the study. The sample consisted of 28 boys (19.7\%) and 19 girls (13.4\%). The control group included children (N=95) admitted at the time of the study and were selected randomly from the other departments in the 4 hospitals. Their age group was between 6-18 years. There were 47 boys (33.1\%) and 48 girls (33.8\%) at the time of the study.

Measures

Socio-Demographic Information: Variables including age, sex, educational level, living area and family income.

Medical History

Additional information on medical history was obtained, including primary diagnosis, treatment status with respect to dialysis.

The Pediatric QoL Inventory Scale (version 4.0) Arabic Versions\textsuperscript{12}

It is a brief, 23-item multidimensional instrument designed by Varni for measuring pediatric health-related QoL.\textsuperscript{13} The pediatric QoL inventory (PQLI) consists of 4 generic core scales: (1) Physical functioning, (2) Emotional functioning, (3) Social functioning, and (4) School functioning. For this study, the parent proxy-report format was used. The instructions assess how much of a problem each item has posed over the past month. The response scale uses a 5-point Likert-type format, ranging from 0 (never a problem) to 4 (almost always a problem). The raw score for each item is reverse-scored and transformed to a scale from 0 to 100 (0-100, 1-75, 2-50, 3-25, and 4-0), with higher scores indicating better health-related QoL. To create the total scale score, the mean is computed as the sum of the items divided by the number of items answered on all scales. To determine the psychosocial health summary (PHS) score, the sum of items divided by the number of items answered on the social, emotional, and school functioning scales is computed.\textsuperscript{13} The Arabic version was used in the Gaza strip and showed high reliability.\textsuperscript{14,15}

The parent was asked about how much of a problem a specific function has been for their child in the past 4 weeks. The response to each item is based on a 5-point Likert category, ranging from “never”, “almost never”, “sometimes”, “often”, and “always” having a problem. As per the user’s guidelines, the subject’s missing item value of a specific domain using a mean score of the rest of items was included, which do not contain missing values. If more than 50\% of the items in the domain are missing, the domain scores of that subject were not computed. We calculated the domain score by adding the item scores of the corresponding domain, dividing the summed item score by the number of items used in the domain. Then, we linearly transformed the domain scores to a 0-100 scale. We referred 0 as the lowest HRQoL and 100 as the highest HRQoL.\textsuperscript{14,15} The reliability of QoL (Arabic version) scale in this study was N=0.65.
Birleson Depression Self-Rating Scale (DSRS)\textsuperscript{16}

Depression self-rating scale (DSRS) for children: The DSRS for children was developed to assess the degree of depression in children and the youth. The scale comprises 18 items, and is scored on a 3-point scale: Mostly, sometimes, and never, with eight items reversed. The total score ranges from 0 to 36. The clinical cutoff score for depression has been set to $\geq 15$ (Birleson, Hudson, Buchanan, Wolff, 1987).\textsuperscript{16} The DSRS has been reported to have good internal consistency.\textsuperscript{16} The reliability of our Arabic version of the depression scale in this study was $N=0.89$; split half was 0.81. This scale had been used in previous studies in the Gaza strip and showed high reliability.\textsuperscript{17}

STUDY PROCEDURE

Inclusion and Exclusion Criteria ESRD Patients

Participants were all children (N=47) aged between 6-18 years who have a medical record and are registered in hospitals of Ministry of Health as ESRD, attending 4 hemodialysis centers in Gaza strip receiving regular hemodialysis sessions during the study. The age of the children ranged from 6 to 18 years with a mean age of 12.31 years.

Controls

The control group consisted of (N=95) children matched in sex and age, admitted with chronic diseases to the same hospitals. The age of the children ranged from 6 to 18 years with a mean age of 11.7 years.

Children and their parents in both groups were told about the aims of the study and they had the right not to participate in the study. Every subject and his parent in the study received an explanatory letter about the study; the researcher explained to all the participants that the information will be kept exclusively for the research purpose. Informed consent to take part in the study was obtained from the patient and their parents. An official letter of approval to conduct the research was obtained from Helsinki Ethical Committee Gaza Strip (HECGS) and an official letter of approval to conduct the study has been obtained from the Human Resource Development Department in Ministry of Health (HRDDMH), which allowed the researcher to carry out the study. Another official letter was obtained from the general administration of hospitals in order to conduct the study in Government hospitals and facilitate the process of data collection. Data collection was done in a face-to-face interview with all the children and inside the hospitals. The time of the interview was 15-20 minutes. The data collection was done on March 2015.

Statistical Analysis

We analyzed our dataset of 350 subjects using the SPSS 20 Software (Statistical Package for the Social Sciences). We used means and percentages to describe the characteristics of the study sample. In addition to estimating the overall QoL and prevalence of depression, we calculated the prevalence on the basis of the type of participants (cases and control). Independent $t$-test and analysis of variance (ANOVA) were performed to examine differences in both ESRD children and the control groups with respect to QoL, depression and socioeconomic status. For analyzing the association between depression and QoL, Pearson correlation coefficient test was done. Two group MANOVA (e.g., Hotelling’s $t$-squared was done) in which case/control were entered as independent variable and depression and QoL as dependent variables. Statistical significance was assumed at $p<0.05$.

RESULTS

Sociodemographic Characteristics of the Study Sample

Out of 142 children, 47 children were suffering from ESRD and undergoing kidney dialysis, of which 28 children were male (19.7%) and 19 were females (13.4%). While 47 participants of the control group were boys (33.1%) and 48 were girls (33.8%). The age of 15.5% of the participants with ESRD ranged from 6-12 years, the age of 11.3% of the participants ranged from 13-15 years, and the age of 6.3% of the participants ranged from 16-18 years. While the age of 43.7% of the participants in the control group ranged from 6-12 years, age of 14.1% of the participants ranged from 13-15 years, and the age of 9.2% of the participants ranged from 16-18 years. The mean age for ESRD was 12.31 (SD=2.15) and the mean age for control was 11.7 (SD=3.20). According to the place of residence, 11.3% of the control and 7.1% of the ESR failure patients were from north Gaza, 41.1% of control and 11.3% of ESR failure were patients from Gaza, 7.1% of the control were patients from the middle area and 3.5% of the patients were from the middle area, 5% of the control and 8.5% of ESR failure patients were from Khan Younis, and 2.1% of the control and 2.8% of the ESR failure patients were from Rafah. On the basis of family monthly income, 20.4% of the ESR failure patients had a family income of $300 and less, 4.2% had a family income in the range $301-500, 5.6% had a family income in the range $501-750, and 2.8% had a family income in the range $751 and more. While, 29.6% of the control patients had family income less than $300, 23.2% of the control patients had $301-500, 7.2% of the control patients had $501-750, and 6.3% of the control patients had $751 and more (Table 1).

Medical Characteristics of the Kidney Dialysis End Stage Renal Failure

As shown in Table 2, the analysis of the medical characteristics of end stage renal disease, showed that 59.6% of the children had consanguineous relationship between parents, while, 40.4% had no consanguinity. Also, 95.7% of the children had ESRD alone and 4.3% had co-morbid disease with ESRD. Regarding family history of renal disease in children with ESRD, 14.9% of...
children reported a family history of renal disease. According to the number of dialysis sessions, 42.6% of the children took dialysis for less than three sessions per week and 57.4% of the children took dialysis for less than five sessions per week (Table 2).

Means and Standard Deviation of Depression between Two Groups

In order to find the differences in the mean of depression between the two groups, independent t-test was conducted. The results showed that the mean depression scores in children with ESRD was 20.13 (SD=7.67) and mean depression scores in control groups was 12.63 (SD=6.16). There were statistically significant differences in depression scores between the two groups among children with ESRD (t(140)=7.50, p<0.001) (Table 3).

Prevalence of Depression Disorder

Using the clinical cut-off score for depression which had been set to ≥15 by Birleson and used in the previous studies conducted in Gaza strip. The result showed that (N=37/47) children with ESRD had depression (78.7%) compared to (N=28/95) of control group children who had depression (29.5%). There were statistically significant differences in depression among children with ESRD (χ²=29.81, df=1, p=0.001) (Table 4).

QoL of Study Sample Means and Standard deviation of QoL and subscale

As shown in Table 4, the study showed that the mean total QoL in children with ESRD was 48.98 (SD=10.88) compared to the mean scores of 52.75 (SD=10.15) in the control group. There were statistically significant differences in the total QoL between the children in the control group (t(140)=2.03, p<0.04). The mean physical functioning scores for children with ESRD was 14.02 (SD=5.98) and for the control group was 21.24 (SD=5.77). There were statistically significant difference in physical functioning among children in the control group (t(140)=6.94, p<0.001). Emotional functioning for ESRD mean was 14.04 (SD=4.32), and the control group children mean scores were recorded at 9.68 (SD=4.21). There were statistically significant differences in emotional functioning for children with ESRD (t(140)=6.94, p<0.001). The social functioning mean in ESRD children was 9.96 (SD=3.93) and 8.32 in control group (SD=3.69). There were statistically significant differences in social functioning for children with ESRD (t(140)=2.44, p<0.02). School functioning mean in children with ESRD was 11.38 (SD=3.61) and control group children was 12.77 (SD=2.68). There were statistically significant differences in school functioning among children in the control group (t(140)=2.56, p<0.01) (Table 5).

Relationship between Depression and QoL of the Children with End Stage Renal Failure

The Pearson correlation test shows that there is a statistically significant positive relationship between total depression and emotional functioning (r(140)=0.53, p<0.001) and a negative relationship with school functioning (r(140)=−0.36, p<0.001). For the control group, there was a statistically significant positive relationship between total depression and social functioning (r(140)=0.27, p<0.001) and negative relationship with physical

---

### Table 1: Sociodemographic Characteristics of the Study Sample.

<table>
<thead>
<tr>
<th></th>
<th>Case (ESRD) (n= 47)</th>
<th>Control (n= 95)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean Age</strong></td>
<td>12.31 (SD=3.25)</td>
<td>11.17 (SD=3.20)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>28</td>
<td>47</td>
</tr>
<tr>
<td>Female</td>
<td>19</td>
<td>48</td>
</tr>
<tr>
<td><strong>Place of residence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Gaza</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Gaza</td>
<td>16</td>
<td>59</td>
</tr>
<tr>
<td>Middle area</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Khan Younis</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Rafah</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td><strong>Family monthly income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$300 and less</td>
<td>29</td>
<td>42</td>
</tr>
<tr>
<td>$301-500</td>
<td>6</td>
<td>33</td>
</tr>
<tr>
<td>$501-750</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>$751 and more</td>
<td>4</td>
<td>9</td>
</tr>
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</table>

ESRD: End-stage renal disease; SD: Standard deviation.
Table 2: Medical Characteristic of ESRD Children undergoing Dialysis.

<table>
<thead>
<tr>
<th>Medical Characteristics</th>
<th>N</th>
<th>%</th>
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<tr>
<td>Consanguinity of parents</td>
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</tr>
<tr>
<td>Consanguineous</td>
<td>28</td>
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</tr>
<tr>
<td>No Consanguinity</td>
<td>19</td>
<td>40.4</td>
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<tr>
<td>Current diseases</td>
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<tr>
<td>Renal Failure</td>
<td>45</td>
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</tr>
<tr>
<td>Renal Failure &amp; other disease</td>
<td>2</td>
<td>4.3</td>
</tr>
<tr>
<td>Previous family history of renal failure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>40</td>
<td>85.1</td>
</tr>
<tr>
<td>Yes</td>
<td>7</td>
<td>14.9</td>
</tr>
<tr>
<td>Number of other diseases in family</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 2 diseases</td>
<td>15</td>
<td>31.9</td>
</tr>
<tr>
<td>Less than 4 diseases</td>
<td>3</td>
<td>6.4</td>
</tr>
<tr>
<td>None</td>
<td>29</td>
<td>61.7</td>
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<tr>
<td>Other diseases in family</td>
<td></td>
<td></td>
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<tr>
<td>Handicapped</td>
<td>1</td>
<td>2.1</td>
</tr>
<tr>
<td>Thalassemia</td>
<td>1</td>
<td>2.1</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2</td>
<td>4.2</td>
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<tr>
<td>Cancer</td>
<td>1</td>
<td>2.1</td>
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<tr>
<td>Neurological</td>
<td>1</td>
<td>2.1</td>
</tr>
<tr>
<td>Liver cirrhosis</td>
<td>1</td>
<td>2.1</td>
</tr>
<tr>
<td>Gastric problems</td>
<td>1</td>
<td>2.1</td>
</tr>
<tr>
<td>Renal failure</td>
<td>4</td>
<td>8.5</td>
</tr>
<tr>
<td>Kidney Stone</td>
<td>1</td>
<td>2.1</td>
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<tr>
<td>Nothing</td>
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<td>72.3</td>
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<tr>
<td>Less than 3 times</td>
<td>20</td>
<td>42.6</td>
</tr>
<tr>
<td>Less than 5 times</td>
<td>27</td>
<td>57.4</td>
</tr>
<tr>
<td>Dialysis Hours</td>
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<td></td>
</tr>
<tr>
<td>Less than 3 hours</td>
<td>5</td>
<td>10.6</td>
</tr>
<tr>
<td>Less than 5 hours</td>
<td>42</td>
<td>89.4</td>
</tr>
<tr>
<td>Place of dialysis</td>
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<td></td>
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<td>14</td>
<td>29.8</td>
</tr>
<tr>
<td>Rantisi Hospital</td>
<td>25</td>
<td>53.2</td>
</tr>
<tr>
<td>Al Aqsa Hospital</td>
<td>4</td>
<td>8.5</td>
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<tr>
<td>Naser Hospital</td>
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<td>8.5</td>
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<tr>
<td>Total</td>
<td>47</td>
<td>100.0</td>
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</table>

ESRD: End-stage renal disease.

Table 3: Depression of Cases and Control Group.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>SE</th>
<th>MD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Confidence interval of the difference</td>
</tr>
<tr>
<td>ESRD</td>
<td>47</td>
<td>20.13</td>
<td>7.67</td>
<td>1.12</td>
<td>-6.28</td>
<td>-7.50</td>
<td>0.001</td>
</tr>
<tr>
<td>Control</td>
<td>95</td>
<td>12.63</td>
<td>6.16</td>
<td>0.63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ESRD: End-stage renal disease; SD: Standard deviation; SE: Standard error; MD: Mean deviation.
Table 5: Means and Standard Deviation of Quality of Life and Subscales.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>95% Confidence Interval of the Difference</th>
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</thead>
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<tr>
<td>Quality of life</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>52.75</td>
<td>10.15</td>
<td>1.04</td>
<td>2.03</td>
<td>0.04</td>
<td>0.10 - 7.43</td>
</tr>
<tr>
<td>ESRD</td>
<td>49.98</td>
<td>10.88</td>
<td>1.59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical functioning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>21.24</td>
<td>5.77</td>
<td>0.59</td>
<td>6.94</td>
<td>0.001</td>
<td>5.16 - 9.28</td>
</tr>
<tr>
<td>ESRD</td>
<td>14.02</td>
<td>5.98</td>
<td>0.87</td>
<td></td>
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</tr>
<tr>
<td>Emotional functioning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>9.68</td>
<td>4.21</td>
<td>0.43</td>
<td>-5.76</td>
<td>0.001</td>
<td>-5.85 - 2.86</td>
</tr>
<tr>
<td>ESRD</td>
<td>14.04</td>
<td>4.32</td>
<td>0.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social functioning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>8.32</td>
<td>3.69</td>
<td>0.38</td>
<td>-2.44</td>
<td>0.02</td>
<td>-2.97 - -0.31</td>
</tr>
<tr>
<td>ESRD</td>
<td>9.96</td>
<td>3.93</td>
<td>0.57</td>
<td></td>
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<tr>
<td>School functioning</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>12.77</td>
<td>2.68</td>
<td>0.28</td>
<td>2.57</td>
<td>0.01</td>
<td>-2.97 - -0.31</td>
</tr>
<tr>
<td>ESRD</td>
<td>11.38</td>
<td>3.61</td>
<td>0.53</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

ESRD: End-stage renal disease; SD: Standard deviation; SE: Standard error.

functioning \( r(140)=-0.29, p<0.001 \) (Table 6).

Differences in Depression and QoL in the Children with ESRD and Control Group

Cohen’s \( d^{18} \) was selected as the measure of effect size, because of its widespread use in the literature. To calculate \( d \), the difference between ESRD children with depression compared to control group children was as follows:

Input data provided:

For ESRD children, Mean 1: 20.13 (SD 1: 7.67).

For control group children, Mean 2: 12.63 (SD 2: 6.16).

Cohen’s \( d \) was: \( d=1.085 \).

Such findings showed high effect size (effect sizes as small \( d=0.2 \), medium \( d=0.5 \), and large \( d=0.8 \) based on the benchmarks suggested by Cohen (1988).\(^{18}\)

In order to find the effect size between the children with ESRD and the control group with respect to the QoL, Cohen’s \( d^{18} \) was selected as the measure of effect size, because of its widespread use in the literature. To calculate \( d \), the difference in means between children with ESRD with respect to QoL was

Table 5: Means and Standard Deviation of Quality of Life and Subscales.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>SE</th>
<th>t</th>
<th>p</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>52.75</td>
<td>10.15</td>
<td>1.04</td>
<td>2.03</td>
<td>0.04</td>
<td>0.10 - 7.43</td>
</tr>
<tr>
<td>ESRD</td>
<td>49.98</td>
<td>10.88</td>
<td>1.59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical functioning</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>21.24</td>
<td>5.77</td>
<td>0.59</td>
<td>6.94</td>
<td>0.001</td>
<td>5.16 - 9.28</td>
</tr>
<tr>
<td>ESRD</td>
<td>14.02</td>
<td>5.98</td>
<td>0.87</td>
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<tr>
<td>Emotional functioning</td>
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<td></td>
</tr>
<tr>
<td>Control</td>
<td>9.68</td>
<td>4.21</td>
<td>0.43</td>
<td>-5.76</td>
<td>0.001</td>
<td>-5.85 - 2.86</td>
</tr>
<tr>
<td>ESRD</td>
<td>14.04</td>
<td>4.32</td>
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<td>Control</td>
<td>8.32</td>
<td>3.69</td>
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<td>-2.44</td>
<td>0.02</td>
<td>-2.97 - -0.31</td>
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<tr>
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<td>3.93</td>
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<tr>
<td>Control</td>
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<td>2.68</td>
<td>0.28</td>
<td>2.57</td>
<td>0.01</td>
<td>-2.97 - -0.31</td>
</tr>
<tr>
<td>ESRD</td>
<td>11.38</td>
<td>3.61</td>
<td>0.53</td>
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</tr>
</tbody>
</table>

ESRD: End-stage renal disease; SD: Standard deviation; SE: Standard error.

<table>
<thead>
<tr>
<th>Table 6: Pearson Correlation Coefficient Test of the Study Variables in Children with ESRD and Control Group.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>1. Depression</td>
</tr>
<tr>
<td>2. QoL</td>
</tr>
<tr>
<td>3. Physical functioning</td>
</tr>
<tr>
<td>4. Emotional functioning</td>
</tr>
<tr>
<td>5. Social functioning</td>
</tr>
<tr>
<td>6. School functioning</td>
</tr>
</tbody>
</table>

ESRD: End-stage renal disease;
compared with the control group children as follows:

**Input data provided:**

For ESRD children, Mean 1: 52.75 (SD 1: 10.15).

For control group children Mean 2: 48.98 (SD 2: 10.88).

Cohen’s d was: (d=0.35). Such finding showed small effect size (effect sizes as small (d=0.2), medium (d=0.5), and large (d=0.8) based on the benchmarks suggested by Cohen.18

Partial eta squared can be computed with SPSS (e.g. using “effect size” under Analyze, General Linear Model) to compare the QoL and depression between children with ESRD relative to the control group.

In order to find the differences in total depression and QoL between the two groups, Hotelling’s T, MANOVA analogue of the two group t-test situation; was done in which one dichotomous independent variable was ESRD and control group, and multiple dependent variables were depression and QoL. The results showed that there was a statistically significant interaction effect between case/control on the combined dependent variables (depression and QoL), $F$ (2,139)=21.36, $p=0.001$; Hotelling’s Trace=0.307 (Table 7).

**DISCUSSION**

This study was conducted to determine the prevalence of depression and the QoL among children with ESRD attending hemodialysis sessions in Gaza strip compared to the children who were admitted to the hospital. This study showed that the prevalence of depression in children with ESRD and under dialysis was 21.1% compared to 12% among children in the control groups. Our study showed that the mean total QoL in children with ESRD was 48.98 as compared to the mean scores of QoL 52.75 in the control group. There were statistically significant differences in the total QoL with the children in the control group. Our study rate of depression was higher than found by Bakr et al.19

Similarly, in a study to assess depression, anxiety, and QoL in a cohort of children and adolescents with ESRD, were compared with healthy controls. Thirty-two children and adolescents 8-18 years of age were enrolled in the study. There was a significant difference in mean depression score, which was significantly higher for the ESRD patients. The mean anxiety score was significantly lower for ESRD patients than for the control group. Regarding QoL score, there were significant differences between the ESRD patients and control groups for both child-rated and parent-rated QoL scores, which were significantly lower for ESRD patients.20 Similarly, clinical data were collected from 28 children and adolescents with pre-dialysis CKD and 28 healthy sex- and age-matched controls. The results showed that, of the 56 children enrolled in the study, the CKD patients were referred to mental health professionals more frequently than the controls. Patients exhibited higher scores for separation anxiety and a higher frequency of clinically significant depressive symptoms. They also had lower overall QoL scores, as well as poorer scores for the psychological, educational and psychosocial sub-domains of QoL instruments. There was a negative correlation between anxiety and depressive symptoms and all domains of QoL.21 Our results were consistent with who undertook a study to determine the incidence of depressive symptomatology and to evaluate the QoL among 64 Sudanese children on hemodialysis and 6 on continuous ambulatory dialysis. Almost half of the patients were having depressive symptomatology (47.1%) with a variable degree of severity. Depression symptoms were found to be common among patients undertaking hemodialysis (44.3%) and were associated with school absenteeism, low adequacy of dialysis, female gender and adolescent age. One third of the patients on chronic dialysis had impaired QoL, another third had poor QoL and the rest had average QoL.22 Similarly, Kul et al.23 in a study aimed to compare the QoL of children and adolescents in various stages of their CKD, who were managed with different treatment modalities to that of children and adolescents without any chronic disease. The study included 18 renal transplant and 21 dialysis patients (8 on hemodialysis, 13 on peritoneal dialysis) and 16 patients who did not yet require renal replacement therapy. The control group consisted of 37 children without any chronic disease. CKD patients had lower scores in all scales of pediatric QoL inventory (PQLI) than the control group. There were no differences in self-reported scores on the

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**Table 7: Multivariate Test of Total Depression and QoL According to Case/Control.**

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependent Variable</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected model total QoL</td>
<td>Depression</td>
<td>1766.85a</td>
<td>1</td>
<td>1766.85</td>
<td>39.45</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>446.58b</td>
<td>1</td>
<td>446.58</td>
<td>4.13</td>
<td>0.04</td>
</tr>
</tbody>
</table>

*df: Degrees of freedom; QoL: Quality of life.*
pediatric QoL scale scores between treatment groups; however, parents of the transplant patients had reported higher (more favorable) physical health summary scores than those of the dialysis patients. Our study showed that physical, school functioning were more in control group children. While, emotional functioning and social functioning were more in children with ESRD. Such findings were consistent with the study of Varni and co-workers who reported that children with ESRD exhibited better emotional scores of HRQoL than children with other chronic diseases, including diabetes, asthma, cerebral palsy and cardiac and rheumatologic diseases.24

CONCLUSION

This study showed that the prevalence of depression in children with renal failure and under dialysis was double the prevalence rate among other control groups. Also, total QoL for ESR failure was lower than the control group. There were statistically significant positive relationships between total depression and emotional functioning, and negative relationship and school functioning. These findings suggest that there are very strong risk factors associated with depression, which increase emotional functioning and decrease school functioning of children with ESR failure.

CLINICAL IMPLANTATIONS

The results of the present study might help in developing a deep understanding of the issues that may influence the overall health of the subjects affecting their QoL leading to depression. Moreover, due to a significant decrease in the QoL domains among ESRD patients undergoing HD in Gaza, and a significant increase in the rate of depression among ESRD patients, we emphasized on increasing the efforts to avoid negative impacts on QoL and depression by establishing a psychosocial support program to decrease the level of depression and enhance the QoL, to coordinate between the Ministry of Health and non-governmental organization to apply for a psychological support program. The training of the team needs to be conducted to deal with ESRD to provide support to the patient and their families, encourage communication between healthcare givers and ESRD patients. The educational program should be designed and counseling team set up, to work with the patients to be able to cope with the new condition. Psychological programs should be designed for families dealing with their children to decrease the level of depression and promote their QoL.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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Stendhal Syndrome: A Psychological Response Among Tourists

Swarna Datta, MSc
Independent Researcher, Kolkata, WB 700045, India

ABSTRACT

Stendhal Syndrome (SS) is a behavioral syndrome characterized by anxiety and affective and thought disturbances in response to art and often to culturally or historically significant places. The purpose of this review is to elucidate the clinical significance of SS and discuss the various approaches implemented towards understanding the condition. Our objective is directed towards promoting further research to understand the etiology of SS as a rare medical condition and to define other potential perspectives in its investigation.

KEY WORDS: Stendhal Syndrome (SS); Psychiatric condition; Clinical symptoms; Tourist city syndromes; Neuroaesthetics.

INTRODUCTION

Stendhal Syndrome (SS) is a rare psychiatric condition characterized by a state of dizziness, panic, paranoia or madness caused by being exposed to artistic or historical artifacts or having witnessed too many of these artworks at the same time. Tourism has been identified as a potential cause of the emotional processes previously reported in the clinical cases of SS. Existing studies report the occurrence of similar emotional responses among tourists after visiting geographically and culturally distinct places as has been clinically manifested in a range of tourist city syndromes, discussed in detail in this paper. The recurrence of symptoms across mild emotional disturbances to psychoses that occur when some people visit certain cities, has drawn the attention of various researchers seeking to investigate SS and related syndromes from the perspective of medical sciences. It is towards this objective that this paper invites for further focus on the study of SS, emphasizing on the relevance of neuroaesthetics as a promising approach to the study, by offering a review of extant research on SS, and by pointing towards new paradigms for examining such phenomenon.

AN OVERVIEW OF STENDHAL SYNDROME

SS gets its name from an avid French traveler and writer, Marie-Henri Beyle, also known to the world as Stendhal. Stendhal drew from his experiences of travelling across the globe in his literary creations and is quite rightly known for introducing the French with the word “tourist” through his writings. This yen for travelling had led Stendhal to a multitude of emotional experiences, and it is one particular experience of visiting Santa Croce Cathedral, Florence, Italy in 1817 that is of significance here.

Stendhal talks about how the rich culture and history that Italy unfolded to him through art stirred strong emotions in his heart. He experienced a condition which was emotionally overwhelming and evoked in him a feeling of intense ecstasy and euphoria. The debilitating condition was marked by a short episode of palpitation, dizziness, and the lack of physical strength to even walk by himself. The description of Stendhal’s overpowering experience in his book based on the “Travel Disease” or “Art Disease” instilled the confidence in many tourists, who experienced anxiety and agitation during their trip to Italy, to talk about their discomfort candidly.
In 1979, an Italian psychiatrist, Graziella Magherini, the Chief of Psychiatry at the Santa Maria Nuova Hospital, Florence, Italy, examined tourists, mostly brought directly from museums and art galleries, admitted under emergency conditions for sudden episodes of panic attacks and mental instability. The symptoms that were commonly observed among the 106 affected patients were identity crisis, physical and mental exhaustion, dizziness, and hallucination. Magherini’s book entitled “La Sindrome di Stendhal” identifies these clinical characteristics as a reaction to the deep impression cast by historically significant characters and the rich Italian culture encountered in the patients’ travels. In particular, the book also discusses agitated and psychotic responses to paintings or sculptures depicting historical revelations or wars. The intense emotions experienced by a prominent literary figure like Stendhal in response to the rich Italian history and art, led Magherini to associate related clinical symptoms with that of SS.

EVIDENCE OF PRE-EXISTING RESEARCH IN STENDLHAL SYNDROME

Beyond the obvious and intricate psychological responses to various socio-cultural and religious aspects of travel, there is a potential and need for investigating other physiological conditions culminating in SS. This includes an examination of genetic regulation, molecular and cellular signaling mechanisms, biochemical pathways, and affected neural networks underlying this and other related conditions. Existing research on the syndrome is addressed primarily from the perspectives of neuroaesthetics and neurophysiology.

Recently, a large number of clinically reported cases of SS have been intensively discussed beginning with an instance in 2005, in which Amâncio, a Brazilian neurosurgeon, reported the case of a Russian novelist who showed the symptoms of SS. In 2009, Nicholson wrote about an episode of paranoid psychosis experienced by a 72-year-old following his visit to Florence. Published in the British Medical Journal Case Reports, this case describes the patient’s eagerness to visit the Ponte Vecchio Bridge; and having visited the site, of his experience of disorientation and “florid persecutory ideation”. Such paranoia even included references to international airlines, bugging of rooms, and other strange and peculiar notions. These symptoms gradually subsided over three weeks of physical rest.

In 2010, Bamforth published evidences of similar symptoms as concluded from the experiences of the two psychologists, Carl Gustav Jung and Sigmund Freud, both of whom had reported symptoms pertaining to SS. In his autobiography, Jung talked about an incident in Pompeii where he was mentally and physically overwhelmed by artwork. Under the spell of such an intense experience, he lost his senses and discontinued his journey to Rome – a destination he was never visited, given the deeply moving impressions Europe’s imperial structures and art left on him. Freud too, reported a similar encounter with art during his visit to the Acropolis of Athens. The encounter incited in him a feeling of enthusiasm followed by a sense of depersonalization and alienation. This overpowering mental state was stimulated by Sigmund Freud’s lifelong fascination with the ideas of Acropolis and the Greek civilization. Aside from approaching such mental states as clinical manifestations, it has been treated as a state of extreme disillusionment. Given the multiplicity of such reported cases it is worth addressing the role and exclusivity of places of paramount beauty or aesthetic value in stimulating SS among tourists. There has been more recent mention of an investigation of physiological attributes by a research group in Italy, who are measuring clinical parameters such as heart rate, blood pressure, and respiratory rate, relevant to SS among visitors of the historically significant, Palazzo Medici Riccardi in Florence, Italy.

Despite various cases of SS being documented, it is yet to be mentioned in the American Psychiatric Association’s Diagnostic and Statistical Manual of Mental Disorders - fifth edition (DSM-5). This could possibly be due to the inability of such clinically reported cases to meet the parameters of dysfunction necessary to qualify as a mental health disorder according to the revised clauses of DSM-5. Of particular importance is the failure to comply with the postulate stating that “the impairment in personality functioning and the individual’s personality trait expression are not better understood as normative for the individual’s developmental stage or socio-cultural environment.”

There have been similar records of extreme emotional responses clinically manifested as behavioural syndromes in tourists visiting places rich in art, history, and culture, which will now be discussed in the form of other tourist syndromes in the following section.

OTHER TOURIST CITY SYNDROMES

Tourist city syndromes are an intriguing aspect of study in the sense that it is commonly associated with cities that possess distinct cultural and religious significance, and thus hold a special meaning for the tourists. These cities seem to precipitate characteristic reactions among certain visitors by virtue of their reputations. The following paragraphs provide a brief overview of the lesser known but widely experienced behavioral syndromes similar to SS but named after cities, in terms of tourism and metaphorical associations.

The Venice Syndrome is a behavioral condition associated with Italy, where reportedly 51 men and women from Germany, France, USA, England, and other parts of the world attempted to commit suicide between the years 1988 and 1995. Those who survived following the suicide attempt confessed that their sole purpose of visiting Venice was to kill themselves which, according to the studies conducted by Italian researchers, was often described as the “Symbol of Death”.

In a similar way, the experience of being in Rome was found to stimulate Jerusalem Syndrome, which entails a state...
of *caput mundi* – a feeling of lightness associated with spiritual awakening.\(^9\) Even though the first medical case of Jerusalem Syndrome was first reported in 1930 by an Israeli psychiatrist, Herman\(^1\), it was not until 1970 that the clinical records of the syndrome began to be maintained by the Kefar Shaul Mental Health Centre, Jerusalem. The records present a count of approximately 100 medical cases of Jerusalem Syndrome being reported every year and 40 patients being admitted for it on average. Living in the delusion of being an imaginary religious figure, the affected pilgrims compulsively indulged in chanting sermons and Biblical verses and obsessed over cleansing of the soul, marked by continued bathing and cutting of finger and toenails.

Visits to other religious sites such as Mecca and the Vatican have also been known to induce similar psychedelic responses in tourists. One study reports an interesting medical case of a 62-year-old woman who travelled to Egypt from Israel with her husband.\(^12\) The patient expressed anxiety, sleeplessness, restlessness, mood fluctuations, and abnormal behavior during the trip. She preached continuously, did not want to leave the church, offered water to other tourists by calling it wine, licked the floor in her hotel room, cleaned her entourage, hit herself in the stomach, and claimed that she was possessed. Investigation revealed that the patient had previously experienced a similar condition 20 years ago during her visit to the Vatican and on a work trip to Turkey. She was kept under surveillance in the hospital for over a month following which she was discharged with a prescribed dose of psychiatric medicines and an agreement with her husband to not let her visit any other places of worship in the future.\(^1\)

Besides art, history, culture and religion, syndromes are also triggered by the otherness of a destination. The Paris Syndrome is a notable but rarely discussed instance of such cases. It was first reported in the French psychiatric journal, Nervure, in 2004, describing a frequently observed psychological anomaly in Japanese tourists on their visit to the City of Lights.\(^13\) The syndrome is symptomatic of extreme agitation that has led patients to hallucinate about their hotel rooms being bugged or to consider themselves historically significant and powerful leaders of France. Possible reasons for the Japanese being susceptible to this condition are the stark contrast between the Parisian lifestyle with their own, unfamiliarity with the place and the language, and expectations from the idealized image of Paris as depicted in movies and pictures. The frequency of tourists affected by this syndrome has necessitated a 24 hour helpline by the Japanese embassy, which ensures immediate medical access to tourists in case of a psychological breakdown. While bedrest is a commonly suggested method for recovery in such cases, leaving the city under medical supervision may be the only option bearing positive results under critical conditions.\(^14\)

Asia has also captivated the attention of various Western tourists who tend to be drawn towards “dharmic” philosophy (religions or beliefs from India) and traditions.\(^15\) Holy places in India, particularly Varanasi, Rishikesh, Auroville, and Dharamsala, are considered significant in spiritual pursuits of meditation, self-discovery, consciousness, self-empowerment, healing, and yoga, evoking revelations about self-identity, personal discovery, empowering, and healing among their followers.\(^16\) The expectations of evolving as an individual and discovering the true meaning of one’s identity has resulted in the development of India Syndrome among the visitors from the Western world.\(^17\) An incident involving the disappearance of an Irish and an Australian tourist during their trip to Rishikesh in their quest for spiritual enlightenment drew the attention of researchers.\(^18\) Consistent with the conventionally discussed Stendhal and Jerusalem Syndrome, in this case, the affected individuals showed signs of delusion, hallucinations, high blood pressure, and increased heart rate under the burden of the social expectation to undergo a transformation as an individual.\(^19\)

Evidence of such behavioral anomalies caused by religious fervors has also been noted in relation to Buddhism. The most unnerving of those is the incident of a Japanese monk setting fire to a religious building that drew pilgrims and worshippers from all over the world. This incident was later adapted into a novel that based its plot in the Kinkaku-ji Temple, a famous temple in Kyoto, Japan. Though no reported cases of mental illness have been found in the pilgrims to that temple, the novel uses the theory of a Kinkaku-ji Syndrome to explain the monk’s psychological stimulus in destroying a temple of religious and cultural significance.\(^20\)

Focusing on another attribute of psychological condition related to travelling brings us to discuss the Airport, or Airport Wandering, Syndrome, in which the affected individuals are found unaware of their identity or any relevant details of their whereabouts. Being lost in the airport without a travel purpose is in itself symptomatic of a pre-existing mental disease.\(^20,21,22\) Rare occurrences of similar psychological abnormalities have been reportedly experienced by visitors in art galleries or museums, often indicated in their comments as “Art Headache”, “Cultural Overload”, “Museum Fatigue” and “Cultural Overflow”.\(^21\) Evidence supports similar influences on reading fictional literature and witnessing scenes of immense beauty.\(^21,23\)

The stimulating relationship between the tourist and the destination leaves a deep impact on the observer’s mind. Often, the tourist’s brain is so positively influenced by the experience so as to be stressed by it, thus, culminating in the clinical symptoms of the widely classified tourist city syndromes such as SS and the others described here.\(^20\)

**POSSIBLE FACTORS AND APPROACHES TOWARDS THE STUDY OF STENDLH SYNDROME**

Travelling is often motivated by the coming into contact with art, history, and culture of a destination, with the expectation that it will lead a tourist to different (and at times richer) feelings.
and sensory experiences. This motivation underlies the nature of association between the tourist and the destination. Seneca, the Italian philosopher, once said that a tourist’s gaze is akin to a child’s wonderment at seeing the unfamiliar. For tourists with psychological difficulties, such wonderment and foreignness of travel can lead to a range of symptoms like longing for possessions, fits of anger, expression of love, and a burdened mind. Other than a history of mental illness, individuals who are psychologically fragile and overtly sensitive or emotional are also susceptible to such symptomatic behavior.

In 1999, Hall and Page elucidated the importance of scholarly research towards investigating the aspect of human motivation in tourism. They draw on Maslow’s theories of human needs and motivation to posit that travelling enabled individuals to discover their true selves by exploring the depth of their emotions. A related classification model was developed by Mitchell in 1983 based on a study of nine types of people, such that the higher levels of the model represent the inner-directed tourist who depends on travel as a means to self-reflect and introspect. In the 1980s, McNulty identified that 38% of the tourist population in his study fell under this category. The higher percentage reported in McNulty’s study indicates an interest among the tourists which should be considered as a pathological predisposition only in a small percentage of people. Current focus on Maslow’s pyramid supports the idea that on reaching the highest level, the pyramid becomes inverted as a mirror extending towards other levels of psychological needs. Thus, the unique experience of a tourist having witnessed a classic tourist attraction cannot be recreated, replaced, or reproduced. Literature, theatre, cinema, and television also perpetuate this tendency by creating a collective imagination for places and experiences, and thereby presupposing tourist syndromes in places other than those typically suspected.

It is on account of the complex emotional strain associated with tourism that researchers have been led to investigate the implicit mechanisms of this phenomenon, which can incite such syndromes in tourists. Though pre-existing studies elucidate in great detail the neurobiological and psychoanalytical approaches towards an understanding of SS, these also pave the way for further research on other potential approaches such as neuropsychesthesia, study of neurobiological mechanisms at the level of genes and signaling mechanisms, and analysis of neural associations and networks across different brain areas to enable a complete understanding of SS in biological terms.

PSYCHOANALYTICAL APPROACH

Magherini devised a psychoanalytical approach to study artistic enjoyment as a complex association of psychological responses, evoked in an observer by artworks. A model equation of this approach is defined by three variables and one constant. The first variable is “the primary aesthetic experience”, which is established at the beginning of life and carried forward intrinsically as a mother-child aesthetic experience. The second variable is “the strangeness”, which brings back remote experiences worth remembering under certain circumstances after having observed a certain piece of art. The third variable is “the selected fact” according to which the perception of the art object can largely influence the reaction evoked in the observer. The constant in this equation is the content, the symbolism, and the parameters that shape the artistic value of the art object. This equation represents the distinct responses of different individuals to the same artwork, or a reaction of the same individual to the same artwork at different times of his life. The self-explanatory equation as presented by Dr. Magherini can thereby possibly be applied towards understanding the range of distinct emotional and psychological responses that an artwork or a tourist destination can elicit in the observer when affected by SS.

NEUROPHYSIOLOGICAL APPROACH

The clinical diagnosis of multiple cases of SS was reported by Magherini for the first time in medical history. Her contribution towards the treatment of patients presenting with a range of emotional responses and behavioral anomalies created awareness and knowledge of the commonly experienced clinical symptoms among those affected by SS. On the basis of her record of treating such patients, she inferred that the disease had an unpredictable and unexpected onset. The symptoms lasted for about 2 to 8 days, triggered thought disturbances in 66%, affective disorders in 29%, and anxiety disorders with panic attacks in 5% of the patients. The characterizing symptoms of the affected also included sweating, physical weakness, tachycardia, chest tightness and a sense of alienation, anxiety, and confusion. Among the less commonly reported symptoms were agitation and the desire to destroy local works of art.

Over 50% of the reported cases of SS indicated a medical history of psychiatric disorders in the patients. Repressed sexual drive, fatigue, inadequate sleep, or the coming to the end of a trip were some of the potential factors which were commonly attributed to its clinical manifestation. Although, some patients were undergoing moments of change or uncertainty, they were mostly psychologically sound before the onset of SS. A comparison of the patients with the unaffected tourists based on demographic and socio-cultural attributes revealed that older mean age and lower educational qualifications were likely predisposing factors. Among the affected tourists were a smaller percentage of managers, businessmen, or professionals compared to healthy tourists, who mostly comprised women on an unplanned trip.

Guerrero et al investigated the incidence of SS and related symptoms in a group of neurologists by conducting a survey during a series of professional workshops held in the cities of Rome, Florence, Padua, and Venice. The survey aimed to collect demographic data by interrogating neurologists about symptoms they had observed in the form of positive responses such as aesthetic pleasure, excitement, euphoria, feeling of omnipotence, or negative responses such as changes in perception, feelings of guilt, insecurity, inadequacy, or unpleasant somatic symptoms, and if their patients suffered from a complete or par-
tial form of the syndrome. Of the 48 questionnaires that were handed out to the participants, the mean age was recorded as 50±9 years and the male/female ratio as 1.7/1. Twenty-five percent of the participants reported observing a partial form of SS without any panic attack or thought disorders, but with substantial response to art mainly including pleasure (83%) and emotion (62%). Crucially, none of the neurologists reported serious symptoms of SS but only a partial form of the condition with implications of milder clinical symptoms.7

From the observations, it was noted that SS was more commonly associated with European tourists and rarely with Asians, Italians, and North Americans. Particularly for those living alone, belonging to a classical and religious educational background have a greater tendency to develop SS.6,28 Nicholson et al attributed the occurrence of SS to cultural overload, which evokes an anomalous autonomic reaction among the tourists.

**NEUROAESTHETICS**

Proust, a legendary French novelist and critic of the 20th century, has been closely associated with medicine and neurology because his asthma was considered a psychosomatic condition (neurasthenia).27 It is believed that the author was involved in substance abuse and stimulants, and expressed a morbid fear of having a stroke, language and memory dysfunctions, dizziness, and falls.29-31 The author’s intrinsic fear was reflected in one of his characters who has a fatal stroke on seeing the most beautiful painting in the world, which was the author’s personal favorite. There were also instances of the author experiencing symptoms akin to those of SS, such as malaise, dizziness, tachycardia, and transient loss of consciousness upon visiting an exhibition of Dutch paintings at the Jeu De Paume Museum in Paris.32

The objective to explore the neurobiological mechanism underlying aesthetic enjoyment—a factor affected by SS—brings to the fore the concept of mirror neurons.33,34 Studies conducted on primates, in 1996, observed that certain neurons in the frontal premotor cortex were activated in response to the execution of an action as well as the observation of an executed action by another individual.35 This finding was later also confirmed by research in social behavior postulating that empathy causes and defines response to visual interactions with art.36,37 In support of the physiological basis of empathy, Nietzsche, a 19th century German philosopher, claims that “empathy with other souls is not moral, but a physiological susceptibility manifested by suggestion.”38 Freedberg and Gallese had presented a theory of empathic responses towards artworks, which suggested that observations of art activate mechanisms of stimulation embodying emotions, actions, or bodily sensations. These reactions were considered universal given their basis in neural tissue and a consistent exposure to various historical, social, cultural, and personal factors. However, unlike the psychoanalytical approach, these factors also take into account the perception and perspective towards art.39

Questions directed towards understanding art have been studied extensively with the exception of the functional role of brain as the site of creation, execution, and reception of art. As a result, the neurological aspect of this phenomenon still remains to be explored and examined sufficiently.40 And it is this gap in human understanding that has led to the founding of neuroaesthetics. It is a concept that segments the brain as visual and artistic. The visual brain serves as an instrument of perception, which explains artistic creation and extends into the artistic brain.40,41 According to Zeki,42,43 the underlying assumption in this theory is that the conception and perception of artwork is created in the brain and therefore, aesthetic characteristics are essentially neuroaesthetic. He believed that artists are neurologists who examine the visual brain through the use of various special techniques, and encouraged neurobiologists to take a look at art as a useful field for analysing how the brain functions and thus, demystifying the emotional reaction to beauty in any form.26,42-44

In her more recent research, Magherini analyzed SS by focusing on the constancy of the artwork and not on the clinical characteristics of the patients. For this study, she chose a sculpture of David—symbolic of young physical and mental energy supported by heroism, sensuality and intelligence, which has previously been known to trigger various psychological responses among its spectators.45 A review of the entries in the guest book of the Academy Gallery in Florence, Italy, during the 500th anniversary of the sculpture, was undertaken. This exercise revealed a gamut of responses from the audience: while some were awed by the perfection of the masterpiece, a few pointed at the minute imperfections in the structure. A majority of the visitors expressed positive feelings about the artwork, marveled at its longevity, and were attracted to and even enamored by the statue despite being aware of its inanimate nature. On the other extreme, some of the visitors expressed negative connotations of unpleasant experiences, painful emotions, hostility, competitiveness, and an intense desire to destroy the structure altogether.46

In the following years of discussion on SS, related symptoms were reported in a population of subjects and locations with similar characteristics such as Venice or Rome or places like Jerusalem and India—places associated with religion, mythology, mysticism and culture.46,47 This emphasized the crucial need to understand the causes underlying these disorders in the presence of an artwork or a place of spiritual and aesthetic beauty. In 1952, Kris went on to elaborate how intense emotional responses that are not otherwise expressed easily are highlighted by artistic expressions. The association with art causes an intrinsic and subtle transition in the observer of art, thereby forcing an outburst of suppressed emotions. The intensity of the emotions triggered is enhanced further, depending on the proximity between the observer and the artwork or artifact.26

In 2014, Galleta conducted an unconventional and innovative approach to study the appreciation of aesthetic values of artwork through the use of social media based on the intersection of perceptual psychology, neuroaesthetics,
and information technology. Galleta’s research indicated the possibility of designing an Aesthetic Algorithm, following the analysis of the neural mechanisms associated with aesthetic appreciation, which could predict the aesthetic preferences of the perceivers and viewers.\textsuperscript{45} Based on the principles of Predictive aesthetics, this algorithm can enable the artist to modulate the amount of ‘beauty’ in a work, to elicit a certain emotional response among its audience.\textsuperscript{46} Predictive aesthetics is a planned conditioning that can orient the aesthetic preferences of the audience based on their hedonic needs and stimulation of aesthetic pleasure.\textsuperscript{48} The prediction of the artwork’s beauty can also enable the artists to operate according to aesthetic precognition, thereby allowing them to influence the audience’s preferences by modifying their art. Additionally, this could facilitate the development of aesthetic persuasion through the knowledge of how brain areas can be activated in response to, and appreciation of, beauty. This in turn is likely to induce reactions in perceivers towards visual stimuli such as the use of shapes or colors, support the conditioning of artistic appreciation, and drive the aesthetic preferences of the audience in predetermined ways.

There is a possibility that our admiration and appreciation for art forms is driven by a certain sense of aesthetic determinism and the ability to predict artistic preferences towards a particular artwork. This defines the concept of aesthetic precognition. The perspective of an individual towards a piece of art is driven by the neurophysiological basis of the viewer’s interpretation.\textsuperscript{49,50} The Processing Fluency Theory of aesthetic pleasure establishes the relation between the object and the perceiver by emphasizing the effects of objective stimulus attributes on perceived beauty. Thus, the impact that specific features of artworks has on the aesthetic sense of the viewers defines their perception of beauty. The compositional feature of an artwork drives the aesthetic judgment of an individual, not as a subjective, inborn, or acquired experience, but as a process of adaptation of the observer’s brain to such stimulating hedonic experiences.\textsuperscript{51} Such experiences can also be derived from witnessing different forms of art such as monuments, buildings, and museums which are culturally or historically significant, thereby presenting new directions in the investigation of SS.

The creative inspiration of the artist may be affected and conditioned by the knowledge of brain activation mechanisms of aesthetic pleasure, rendering the artist as a creator of conscious and premediated aesthetics available for subjective interpretation by each individual. Thus, the concept of aesthetic precognition could be a potential measure for gratifying the tastes of the public, in anticipation of the aesthetic preference of the viewers. The researchers believed that the development of an aesthetic algorithm could associate a psychological theory of aesthetic behavior with neurophysiological functions of the human brain and subjective cognitive processes.\textsuperscript{52} Thus, neuroaesthetics presents a strong unifying perspective encompassing the neurobiological, psychoanalytical, and behavioral approach towards understanding the etiology of SS in response to diverse forms of art.

**CONCLUSION**

The objective of this review was to highlight the clinical significance of behavioral conditions such as SS and other related syndromes possibly caused by similar psychosocial factors. Our purpose has been directed towards presenting a review of existent research on SS and to outline the space for the multi-paradigmatic examination of this behavioral phenomenon. Prior studies primarily explored the principles of psychoanalysis and neurobiology; however, the focus of our study was to elucidate the importance of other potentially promising approaches such as neuroaesthetics which can facilitate a better understanding of this rare psychological condition.

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