

Theory to Practice: Analysis of the Biopsychosocial Model in HIV Research

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BIOPSYCHOSOCIAL MODEL IN HIV RESEARCH

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Abstract

The purpose of this study was to examine the use of the biopsychosocial (BPS) model in HIV research. Using qualitative methods, peer reviewed journal articles were identified by searching four databases- PubMed, Medline, ERIC, and PsychINFO-using the following key terms: “Biopsychosocial” and “HIV or AIDS.” There were 596 articles identified. After excluding duplicates and entries that did not report original research, 62 articles were coded using the following themes to identify the focus of the research and the populations studied: age, gender, mode of transmission, population of interest (people living with HIV versus people affected by HIV), type of study (prevention versus intervention), and BPS factors emphasized (biological, psychological, and social). In addition, a qualitative rating of the application of the BPS model (strong, moderate, or weak) was documented. Findings revealed that few articles incorporated all three components of the BPS model into research. However, among those that did, qualitative ratings were strong. Future research is needed to further explore the use of the BPS model in HIV research.

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Chapter 1

Statement of the Problem

The Human Immunodeficiency Virus (HIV) has been an active epidemic since the 1970s, first recognized as an epidemic in 1980. Despite medical advances for HIV treatment, HIV is still a major health issue that impacts over 36.7 million people worldwide (UNAIDS, 2017). According to the Henry J Kaiser Family Foundation [KFF] (2018), the proposed federal funding for 2018 was \$32.0 billion for HIV research. If approved, this budget would be a decrease of over \$800 million from the previous year (KFF, 2018). In the proposed budget, only 7% is designated for domestic research, and 17% for global initiatives, including international research. The international budget has also decreased in recent years going from over \$10.0 billion in 2013 to \$8.1 billion in 2016 (Avert, 2018a; KFF, 2017). The funding that is available largely focuses on biomedical approaches to HIV prevention and treatment with little funding available for social-behavioral HIV research. This is problematic because HIV, like many diseases, is a behavioral disease and, therefore, psychosocial issues are highly relevant to prevention and treatment efforts.

The biopsychosocial (BPS) model has been described as “a way of understanding how suffering, disease, and illness are affected by multiple levels of organization, from the societal to the molecular” (Borrell-Carrio, Suchman, & Epstein, 2004, p. 576). The BPS model is used as a holistic approach to understand diseases or disorders. The combined focus on biological, psychological, and social factors is very helpful because these factors interact despite the medical community’s tendency to focus exclusively on the biology of a disease. Using the BPS model in the context of HIV treatment and research is important because people with HIV experience many psychological and social issues and, in fact, have an increased risk of developing mental

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health issues (National Institute of Mental Health [NIH], 2016). The increased likelihood of mental health problems in people living with HIV (PLWH) is due to a variety of factors including a loss of social support, concerns about HIV stigma and discrimination, and lifestyle changes associated with living with HIV (NIH, 2016). The BPS model provides a good framework for better understanding the biological, psychological and social factors associated with HIV.

Purpose of the Study

The purpose of this study was to explore the application of the BPS model in HIV research. Specifically, this study was designed to determine how the BPS model is being used in HIV research.

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Chapter 2

Review of the Literature

HIV Incidence and Prevalence

The Human Immunodeficiency Virus (HIV) was first acknowledged and reported in 1981 in the *Morbidity and Mortality Weekly Report* (“A Timeline,” n.d.). HIV originally emerged in chimps, but is believed to have crossed species in the early 1900s when hunters were unknowingly killing and eating infected chimpanzees and exposing themselves to the infected blood (Avert, 2018d). After this cross, the virus flourished going from person-to-person unknowingly, eventually resulting in the HIV epidemic. At the point in which HIV was identified and became recognized as an epidemic, it is estimated that between 100,000 and 300,000 people were already infected and transmitting the virus to others (CDC, 2018). Because the virus was initially unknown, it spread rapidly to a large amount of people and to multiple continents due to individuals travelling and partaking in risky behaviors such as unsafe sex, sharing of needles, and accidental blood exchange.

HIV was spreading so rapidly that worldwide funding rose quickly and measures were being made to limit HIV transmission in the early 1980s (Avert, 2018b). During this time, HIV was identified as a retrovirus, a RNA virus that converts its genome into DNA using reverse transcriptase, an enzyme, and inserting it directly into the host cell’s DNA for replication (“Retrovirus,” 2018). By 1999, AIDS was the fourth leading cause of death worldwide with 14 million people already dead from AIDS and another 33 million living with HIV (Avert, 2018b). To address this need, funding was set aside with the goal of ensuring that over 50% of individuals eligible for HIV treatment would receive it by 2012. This goal was indeed met by

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2012 with 54% of eligible people receiving HIV treatment in low- and middle-income countries (Avert, 2018b). By 2017, over 50% of the global population living with HIV was receiving treatment and some areas with high rates of HIV, including Eastern and Southern Africa, had a decrease in transmissions by a third of what it was six years prior (Avert, 2018b).

Despite advances in HIV research, HIV related stigma persists as a barrier to HIV testing and treatment. Real or perceived negative connotations towards individuals with HIV has limited the number of people willing to get tested because of how they believe they will be treated if they test positive (Avert, 2018c). This is very dangerous because without knowing one's status, it is impossible to seek treatment and prevent transmission to others. In the United States (US), individuals at greater risk of contracting HIV include those who participate in male-to-male intercourse and African Americans, which constitute approximately 13.4% of the population (CDC, 2018; "QuickFacts," 2017). HIV rates among these populations were consistent in data from both 2015 and 2016. Those with HIV are known to be more likely to develop mental health issues due to the decrease in social and psychological assistance from their family (NIH, 2016). Limited access to medical care and perceived lack of sympathy from medical staff may also increase the likelihood of developing mental health issues among people with HIV (NIH, 2016).

The Biopsychosocial Model

Prior to the development of the BPS model, only the biomedical model was used in clinical research (Borrell-Carrio, Suchman, & Epstein, 2004). According to George Engel, the creator of the BPS model, the biomedical model had an "excessively narrow (biomedical) focus for leading clinicians to regard patients as objects and for ignoring the possibility that the subjective experience of the patient was amenable to scientific study" (Borrell-Carrio, Suchman, & Epstein, 2004, p.576). The BPS model was developed in a time when science was

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developing into a system that would spread across multiple disciplines (Borrell-Carrio, Suchman, & Epstein, 2004). Since its development, the model has been used in clinical research for different diseases and disorders. According to Jaini and Lee (2015), in a literature review on the BPS model and medical education in the years between the 1970s and 2015, only five medical schools included the BPS model in their curriculum. The five medical schools incorporated a holistic approach based on the BPS model into their mission and objectives (Jaini & Lee, 2015). The BPS model has been used to understand a variety of diseases, injuries, and medical conditions including pain, spinal cord injuries, disabilities, sleepwalking, violence, and more. For example, according to Smedema (2017), the BPS framework is useful for understanding how to improve the well-being of those with spinal cord injuries. The BPS framework has also been used to understand the experience of postpartum depression, specifically, the importance of social and psychological support (Lehman, David, & Gruber, 2017). In addition, the BPS model has been used to understand what it means to live with multiple sclerosis, allowing for the development of more beneficial treatment methods (Wijenberg, Stapert, Kohler, & Bol, 2016). The application is used in a variety of research showing the impact the BPS model could have on HIV research.

Potential Benefits of Using the Biopsychosocial Model in HIV Research

The BPS model is important because it allows individuals with a disease to not be treated for physical complications only, but also for what happens psychologically and socially. Using a holistic approach when treating any disease provides mechanisms for addressing more than just the medical issues at hand. This concept is very important in HIV research because there are unique psychological and social factors that complicate the lives of PLWH. For example, there is a bidirectional relationship between mental health and HIV whereby mental health symptoms

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may increase risk for HIV and may also be a consequence of HIV as described earlier. The BPS model takes into account these factors. The BPS model has been used in pain research, which also may be of relevance for PLWH. Individuals who are mentally healthier and stronger are better able to manage their disease. Understanding the interplay between biological, psychological, and social factors can, therefore, improve the lives of PLWH.

Challenges of Using the Biopsychosocial Model in HIV Research

A major challenge with using the BPS model in HIV research is the incorporation of all three components – biological, psychological, and social. There have been a lot of studies focused strictly on the biological aspects of HIV in medical literature. Meanwhile, much of the social science literature has focused exclusively on psychological and social aspects of HIV. All three factors are important, yet performing studies using all three can be difficult. Further, when focusing on the psychological and social components, it is difficult to classify a universal measure of psychological and social impact of HIV on an individual. The most common way to measure psychological and social impact at an individual level is to utilize surveys and questionnaires. The issue with the use of questionnaires is that it is almost impossible to remove bias from the questions developed for each study. To help limit the level of bias, many studies utilize some common, previously accepted scales including the Beck Depression Inventory to measure depression, the Beck Anxiety Inventory to measure anxiety, the Perceived Stress Scale to measure stress, the Social Support Scale to measure social support and patient contentment, and the World Health Organization's Instrument for Evaluating Quality of Life to measure well-being (Calvetti, Giovelli, Gauer, & Moraes, 2014; Millar, Starks, Gurung, & Parsons, 2016). Different studies use different classification systems that may affect interpretation, making it difficult to compare and contrast results. To develop proper comparative research on all three

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components, there needs to be an increase in the amount of interdisciplinary research involving researchers with expertise in the biomedical, social, and psychological disciplines.

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Chapter 3

Methods

Procedure

Journal articles focusing on HIV/AIDS research using the BPS model were identified by searching the following terms in PsycINFO, PubMed, Medline, and ERIC: “Biopsychosocial and HIV” and “Biopsychosocial and AIDS”. Articles describing original research on people living with HIV or AIDS worldwide using the framework of the BPS model that were directly accessible through the University of South Florida’s library database were included. Articles were excluded if they were duplicates, did not contain information about HIV or AIDS, did not report original research findings (e.g., book reviews, review articles), or could not be accessed through the USF library database.

Data Analysis

Applied thematic analysis was used to code and identify themes in the articles reviewed. A thematic analysis is used in qualitative research to observe patterns within the data. After excluding the duplicates and articles that did not meet the inclusion criteria, remaining articles were coded using the applied thematic analysis method. The themes for the articles were made to isolate information about the different research participants, use of the BPS model, and focus. Themes related to the different studies target populations included the participants’ age, gender, HIV status, and, where applicable, mode of transmission (perinatal, behavioral, or blood transfusion). Themes related to the types of articles reviewed included study focus (prevention or intervention study), study emphasis (biology, psychology, or social emphasis), use of the BPS model, and the journal focus (medical, psychology, psychiatry, or social sciences). The quality of

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the application of the BPS model was categorized as: none (0), minimal (1), moderate (2), and strong (3). The quality of each article was determined based on the quantity of references to the BPS model and whether the information in the article directly acknowledged the model. Articles that referred to the BPS model to analyze the results or discussion were categorized as strong (3). Articles that referenced the BPS model minimally in the introduction or how it could be applied to future studies were categorized as minimal (1) or none (0). Anything in-between was categorized as moderate (2).

Chapter 4

Results

Literature Search

A total of 596 articles were identified using the search methods described above. After removing duplicates (n=400) and excluding articles that did not meet inclusion criteria (n=135), 62 articles remained and were included in the analysis (see Table 1).

Themes

Target Population. Of the 62 studies reviewed, most included participants in the age range 26-64 (n=53; 85%). Of the 62 articles, a majority included both male and females (n=32; 52%). From the remaining 30 articles, there were more studies that focused exclusively on men (n=22; 73%), than studies focused exclusively on females (n=8; 27%) (see Table 2).

The majority of the studies focused on PLWH (n=44; 71%) did not provide information about the mode of HIV transmission (n=39; 89%). Among articles that did provide this information (n=14; 23%), behavioral transmission related to sexual behavior or drug use was the most common (n=13; 93%). Three articles (5%) focused on the caretakers of PLWH (see Table 3).

Study focus. Most articles reviewed described intervention studies (n=44; 71%). Of the remaining 29% (n=18), 89% (n=16) were articles describing prevention studies. There were a few articles that were classified as 'Other' if the article did not clearly represent a prevention or intervention study (n=6; 9.7%) (see Table 4).

Journal focus. The majority of the articles reviewed were published in medical journals (n=34; 55%) followed by psychology journals (n=17; 27%). There was one article published in a

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psychiatric journal (1.6%) and seven articles published in social sciences journals (11%). There were six articles classified as 'Other' (9.7%) (see Table 5).

Biopsychosocial model incorporation. The most emphasized component of the BPS model (biology, psychology or social) was the psychological component (n=43; 69%) followed by a social emphasis (n=28; 45%). The final component was the biological emphasis with 24 articles (39%) (see Table 4).

Of the 62 articles examined, the BPS model was used in 34 (55%). Of the 34 articles that incorporated the BPS model, 24 (71%) were qualitatively rated as minimal. Moderate ratings were assigned for eight (24%) articles, while strong ratings were assigned for only two (5.9%) articles. Many articles did not reference the BPS model in the introduction or analysis (n=28; 45%). Many articles focused on psychological aspects and/or social aspects, but few (n=5; 8.1%) included all three of the BPS model aspects (see Table 6).

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Chapter 5

Discussion

The primary goal of this study was to examine the existing use of the BPS model in HIV research. Findings revealed that few studies incorporated all three components of the BPS model – biological, psychological, and social. Despite its theoretical potential, the application of this model in HIV research is lacking, making it difficult to garner the actual benefits of the BPS model in HIV research. The different components of the BPS model were manipulated with different combinations, including a focus on psychology only, biology only, social only, psychology and social aspects together, biological and psychological aspects together, biological and social aspects together, or biological, psychological, and social aspects together. Given the significant amount of research related to the biology of HIV, it is surprising that few articles incorporated this component of the BPS model. Most of the articles analyzed focused on the psychological component of the BPS model with the social component also occasionally incorporated.

In the few articles that did incorporate all components of the BPS model - biology, psychology, and social – some had interpretative information about the application of the model missing in the discussion and/or overall conclusions section. For example, Herrmann et al (2008) discussed the effects of stress, psychological distress, and the effects of forgetting to take medication on an individual's likelihood to drink and use substances. Unfortunately, there was no reference to the BPS model in the analysis or discussion. Rather, there was only a reference to psychosocial impacts. The only point in the paper that included any acknowledgement of the BPS model was in the background section of the article.

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Cook et al (2016) studied an intervention designed to increase substance use awareness among PLWH. The authors included all three components of the BPS model by looking at the effects of alcohol on PLWH. Unlike Hermann et al (2008), Cook et al (2016) incorporated all three components of the BPS model – biology, psychology, social – while simultaneously incorporating an analysis of the BPS model in the conclusion. The article’s focus was on the reasons women with HIV drink and the consequences of their drinking behavior. Each of the reasons and consequences of drinking were organized into the biological, psychological, and social influences. The review of the BPS model was explained by summarizing each component and drawing conclusions about the potential benefits associated with incorporating awareness of alcohol use in treatment for PLWH.

As another example, Millar et al (2017) incorporated the three BPS model components and referenced the model in the discussion. This article studied older adults living with HIV and the impact of limited activity on HIV disease progression using the framework of the BPS model. The organization of the article was not as efficient as Cook et al (2016), but it was clear that each part of the model was analyzed in the article. The interpretation of the BPS model in this article presented a focus on health of the individual mentally, socially, and physically to determine quality of life. This development was based on the BPS model from a holistic approach to determine the influence of HIV on the quality of life amongst older PLWH. The BPS model in both articles allowed for the establishment of new intervention methods for PLWH to better their quality of life.

Emphasis of the Biopsychosocial Model Components

Overtime, there seems to be a growth in the complete use of the BPS model. Articles that included all three components, but did not reference the model in their analysis such as the

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Herrmann et al (2008) were completed in earlier years, but those that incorporated the model in the analysis are more current including the articles by Millar et al (2017) and Cook et al (2016). This shows an increase in the use of the model in HIV research as the scientific community drifts towards a more holistic approach in medical care. This is possibly because the BPS model was developed as a holistic approach and following the model allows for a more conclusive result that could be compared with other studies. The use of different components of the BPS model separately can result in positive behaviors and treatment improvements, but the use of all three components together could possibly provide more beneficial strategies with all areas of concern being treated.

Studies with a Biological Emphasis. From the articles analyzed, there were some that included either only a biological emphasis, biological and psychological emphasis, or a biological and social emphasis.

An example that emphasized the biological component only was by Auerbach et al (1992). This article focused on the effects medication had on physical functions of PLWH. Thermal biofeedback, guided imagery, and hypnosis were used to decrease the typical symptoms that arise from living with HIV. There was a slight review on depression, which relates to the psychological component of the BPS model, but its reference in the article was based primarily as a symptom of HIV. The use of the biological component of the BPS model to treat the symptoms of HIV resulted in positive effects such as the number of recurring symptoms decreasing and the patient's energy level increasing. With a focus on the biological component, the application to the psychological component was lacking resulting in minimal to no change in the depression or anxiety.

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An article that presented a larger focus on both the biological component and the psychological component was by Shuter et al (2012). The article was strictly focused on how PLWH used smoking to cope with the biological and psychological symptoms they experienced. In the paper, there was a small focus on social support. Specifically, participants were asked to provide information about the types of people influencing their need to smoke. The result of the focus on biology and psychology was the formation of new methods to incorporate into smoking cessation interventions for PLWH. The social component did help authors develop intervention techniques with a focus on benefitting PLWH biologically and psychologically.

An article that focused on the biological component and social component was by Goodkin et al (1992). The article focused on how an active coping style would affect the functionality of the natural killer cells in the body of PLWH. Specifically, the article focused on keeping a positive emotional attitude every day. Results showed that natural killer cell cytotoxicity (NKCC), or cells that keep the bodies immunity up, was positively affected when an individual had an active coping style. Similarly, when an individual had a passive coping style, the levels of NKCC was lower and their health declined. The authors concluded that psychosocial models should be incorporated into the study of immunology.

Studies with a Psychological Emphasis. The articles analyzed included different psychological focus combinations including a psychological emphasis only, psychological and social emphasis, and the psychological and biological emphasis. The combination showing psychological and biological emphasis was discussed above (see section titled Studies with a Biological Emphasis).

An article that focused solely on the psychological component of the BPS model was by Malee et al (2014). The focus of this article was on the use of substances among mothers living

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with HIV. Results revealed the importance of diagnosing and treating psychiatric and substance use disorders. The emphasis solely on the psychological component of the BPS model presented a baseline for future studies to reference, which could be applied towards the development of new HIV prevention and intervention procedures.

Calvetti et al (2014) published an article focused on the psychological and social components of the BPS model. Results showed that the psychological and social needs of PLWH varies based on the medications and treatments they require. Findings showed that social and psychological support helps moderate stress levels, anxiety, and depression, thus providing benefits to overall health and well-being.

Studies with a Social Emphasis. The different BPS model component combinations for the social emphasis included the social emphasis only, social and psychological emphasis, and the social and biological emphasis. The combinations showing social and psychological emphasis and social and biological emphasis, respectively, were discussed above (see sections titled Studies with a Psychological Emphasis and Studies with a Biological Emphasis).

An article showing the use of the social component only was published by Taylor et al (2017). The paper focused on the sexual needs of older women living with HIV. Developments from this study included a change from focusing on the risk of HIV transmission to how to perform sexual activities in a safe and satisfying manner. This article provides an example of how to approach similar social issues relevant to HIV prevention and treatment.

Conclusion

Current findings suggest theory to practice is lacking with regard to applications of the BPS model in HIV research. Few articles adequately apply the model as intended and, instead,

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focus on one or two components as opposed to all three. Among those that did adequately apply the BPS model, findings seemed to have greater significance showing that the incorporation of the BPS model resulted in some benefits and created more possibilities for HIV research. Studies that incorporated the BPS model into the research and analysis produced findings with the potential to improve quality of life for PLWH. There were studies that applied some components, but not all, of the BPS model and provided examples of the potential use of the BPS model in HIV research.

Limitations

A weakness of the applied thematic analysis performed in this experiment is the presence of bias and subjectivity. Due to time constraints, only one person performed the coding, thus eliminating the opportunity to compute interrater reliability. Also, this study was limited to articles accessible through the university library, which means the analysis may not be representative of the existing literature in this area.

Future Directions

Future research is needed to study the applications of the BPS model to HIV research. It is important that studies using this framework incorporate all three components – biological, psychological, social – to allow for adequate interpretation. The BPS model shows promise in the context of HIV research but its utility has yet to be fully realized. To become fully recognized, there needs to be more studies incorporating all three components of the BPS model focused on PLWH and the impact HIV has on quality of life. Results from such studies could be compared to existing research to determine, more conclusively, the application and potential benefits of the BPS model in HIV research.

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Tables

Table 1

Article Search Results

Database	Search Term	Number of Articles Observed	Number of Articles Excluded	Number of Articles Included
ERIC	Biopsychosocial AND AIDS	4	4	0
ERIC	Biopsychosocial AND HIV	4	3	1
Medline	Biopsychosocial AND AIDS	88	87	1
Medline	Biopsychosocial AND HIV	57	39	18
PsycINFO	Biopsychosocial AND AIDS	127	80	47
PsycINFO	Biopsychosocial AND HIV	132	77	55
PubMed	Biopsychosocial AND AIDS	61	47	14
PubMed	Biopsychosocial AND HIV	83	58	25
Total		556	395	161

Note. From the article quantities presented, there were duplicates in the mix.

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Table 2

Age and Gender of Participants

<i>Author (Year)</i> n = 62	Birth to 3	4 – 12	13 – 17	18 – 25	26 – 64	64+	Age Not Specified	Male	Female
Adelekan et.al. (1995)				X	X			X	X
Antoni et.al. (1991)				X	X			X	
Auerbach, Oleson, & Solomon et.al. (1992)					X			X	
Barbanti et.al. (2008)					X			X	X
Bartos & McDonald (2000)							X	X	X
Blaney et.al. (1991)				X	X			X	
Blaney et.al. (1990)				X	X			X	
Blaney et.al. (1991)				X	X			X	
Blashill et.al. (2014)				X	X	X		X	
Calvetti et.al. (2014)				X	X			X	X
Catalan & Meadows (2000)					X			X	
Ceballos-Capitaine et.al. (1990)				X	X			X	
Chesney et.al. (2000)				X	X	X		X	X
Chitwood et.al. (2000)			X	X	X			X	X
Cook et.al. (2016)				X	X				X
Cortes et.al. (2014)				X	X	X		X	X
Dekker & Mootz (1992)			X	X	X	X		X	X
Dowsett et.al. (1992)							X	X	
Faugier & Cranfield (1995)				X	X			X	
Franke et.al. (1992)				X	X				X
Goldstone et.al. (1995)				X	X	X	X	X	X
Goodkin et.al. (1992)				X	X			X	
Grassi et.al. (1995)				X	X	X		X	X
Hallfors et.al. (2012)		X	X					X	X
Harrowing & Mill (2010)					X				X

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Herrman et.al. (2008)				X			X	X
Ironson et.al. (1990)			X	X			X	
Jiao et.al. (2016)			X	X			X	X
Johnson-Masotti et.al. (2000)						X	X	X
Ka'opua & Mueller (2004)				X			X	X
Kennedy et.al. (1995)			X	X			X	X
Klimas et.al. (1991)			X	X			X	
Knippels & Weiss (2000)			X	X			X	
Knippels et.al. (2002)			X	X			X	
Letteney et.al. (2012)			X	X	X		X	X
Malee et.al. (2014)						X		X
Malotte et.al. (2000)		X	X	X	X		X	X
Marquine et.al. (2014)				X			X	X
Millar et.al. (2017)				X	X		X	X
Morin et.al. (1995)						X	X	X
Mulder et.al. (1995)			X	X			X	
Mulder et.al. (1999)			X	X			X	
Mulder et.al. (1994)			X	X			X	
Page (1990)						X	X	X
Remien et.al. (1992)				X			X	
Rey et.al. (1995)		X	X	X				X
Rosso et.al. (2012)	X	X	X				X	X
Rotily et.al. (1995)		X	X	X			X	X
Sale & Gadanya (2008)		X	X				X	X
Seibt et.al. (1995)			X	X			X	
Sherr et.al. (2000)			X	X				X
Shuter et.al. (2012)				X			X	X
Simoni & Cooperman (2000)				X				X
Stein & Nyamathi (2000)		X	X	X			X	X
Stein et.al. (2009)			X	X			X	X
Taylor et.al. (2017)				X	X			X
Thomason et.al. (1996)			X	X			X	X

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Tuck et.al. (2001)			X	X	X		X	
Visintini et.al. (1995)				X			X	X
Webb et.al. (2007)			X	X	X		X	X
Wilkie et.al. (1992)			X	X			X	
Woods et.al. (1992)			X	X	X		X	X

Note. The information collected about the participants are directly from the patient demographics section of the individual articles.

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Table 3

Transmission Type and HIV Status of Participants

Author (Year) n = 62	Perinatal Transmission	Behavioral Transmission	Blood Transfusion	Mode Not Specified	HIV+ Participants	HIV- Participants	HIV Affected	HIV Status Not Specified	HIV Care Takers
Adelekan et.al. (1995)				X		X	X		X
Antoni et.al. (1991)				X	X	X			
Auerbach, Oleson, & Solomon et.al. (1992)				X	X				
Barbanti et.al. (2008)				X	X	X			
Bartos & McDonald (2000)				X	X				
Blaney et.al. (1991)				X	X				
Blaney et.al. (1990)				X	X				
Blaney et.al. (1991)				X	X	X			
Blashill et.al. (2014)				X	X				
Calvetti et.al. (2014)				X	X				
Catalan & Meadows (2000)				X	X				

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Ceballos-Capitaine et.al. (1990)			X	X				
Chesney et.al. (2000)	X			X				
Chitwood et.al. (2000)			X				X	
Cook et.al. (2016)			X	X	X			
Cortes et.al. (2014)			X	X	X			
Dekker & Mootz (1992)			X				X	
Dowsett et.al. (1992)			X				X	
Faugier & Cranfield (1995)	X				X			
Franke et.al. (1992)	X		X	X				
Goldstone et.al. (1995)	X		X	X				
Goodkin et.al. (1992)			X	X				
Grassi et.al. (1995)			X	X	X			
Hallfors et.al. (2012)			X			X		
Harrowing & Mill (2010)			X			X		X
Herrman et.al. (2008)			X	X				
Ironson et.al. (1990)			X	X	X			

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Jiao et.al. (2016)			X	X				
Johnson-Masotti et.al. (2000)			X		X			
Ka'opua & Mueller (2004)			X	X		X		
Kennedy et.al. (1995)			X	X	X	X		
Klimas et.al. (1991)			X		X			
Knippels & Weiss (2000)			X	X				
Knippels et.al. (2002)			X	X				
Letteney et.al. (2012)			X	X				
Malee et.al. (2014)			X	X	X	X		
Malotte et.al. (2000)			X		X			
Marquine et.al. (2014)			X	X	X			
Millar et.al. (2017)			X	X				
Morin et.al. (1995)			X		X	X		X
Mulder et.al. (1995)			X	X				
Mulder et.al. (1999)			X	X				
Mulder et.al. (1994)			X	X				
Page (1990)	X						X	

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Remien et.al. (1992)			X	X	X			
Rey et.al. (1995)	X	X					X	
Rosso et.al. (2012)	X			X				
Rotily et.al. (1995)	X						X	
Sale & Gadanya (2008)			X	X				
Seibt et.al. (1995)	X						X	
Sherr et.al. (2000)			X	X	X			
Shuter et.al. (2012)	X			X				
Simoni & Cooperman (2000)			X	X				
Stein & Nyamathi (2000)			X				X	
Stein et.al. (2009)	X				X			
Taylor et.al. (2017)			X	X				
Thomason et.al. (1996)			X	X				
Tuck et.al. (2001)			X	X				
Visintini et.al. (1995)	X			X				
Webb et.al. (2007)	X	X		X				

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Wilkie et.al. (1992)			X	X	X			
Woods et.al. (1992)	X						X	

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Table 4

Study Type and Emphasis

Author (Year) n = 62	Prevention Study	Intervention Study	Other	Biological Emphasis	Psychological Emphasis	Social Emphasis	Focus is Not Clear
Adelekan et.al. (1995)	X						X
Antoni et.al. (1991)		X		X	X		
Auerbach, Oleson, & Solomon et.al. (1992)		X		X			
Barbanti et.al. (2008)			X	X			
Bartos & McDonald (2000)		X			X		
Blaney et.al. (1991)		X			X	X	
Blaney et.al. (1990)		X			X		
Blaney et.al. (1991)		X			X	X	
Blashill et.al. (2014)		X			X		
Calvetti et.al. (2014)		X			X	X	
Catalan & Meadows (2000)		X			X		
Ceballos-Capitaine et.al. (1990)		X			X	X	
Chesney et.al. (2000)		X		X			
Chitwood et.al. (2000)	X	X			X	X	
Cook et.al. (2016)		X		X	X	X	
Cortes et.al. (2014)	X					X	
Dekker & Mootz (1992)	X				X		
Dowsett et.al. (1992)	X				X		
Faugier & Cranfield (1995)	X					X	
Franke et.al. (1992)		X			X		
Goldstone et.al. (1995)		X		X		X	
Goodkin et.al. (1992)		X		X		X	
Grassi et.al. (1995)			X	X	X		
Hallfors et.al. (2012)	X					X	
Harrowing & Mill (2010)		X			X		
Herrman et.al. (2008)		X		X	X	X	

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Ironson et.al. (1990)		X		X	X		
Jiao et.al. (2016)		X		X			
Johnson-Masotti et.al. (2000)	X				X		
Ka'opua & Mueller (2004)		X				X	
Kennedy et.al. (1995)		X			X		
Klimas et.al. (1991)			X	X			
Knippels & Weiss (2000)		X		X			
Knippels et.al. (2002)		X		X	X		
Letteney et.al. (2012)		X			X	X	
Malee et.al. (2014)		X			X		
Malotte et.al. (2000)		X			X		
Marquine et.al. (2014)			X	X	X		
Millar et.al. (2017)		X		X	X	X	
Morin et.al. (1995)	X			X		X	
Mulder et.al. (1995)		X			X	X	
Mulder et.al. (1999)		X		X	X		
Mulder et.al. (1994)		X			X	X	
Page (1990)	X					X	
Remien et.al. (1992)		X			X		
Rey et.al. (1995)	X				X		
Rosso et.al. (2012)		X		X			
Rotily et.al. (1995)	X	X			X	X	
Sale & Gadanya (2008)		X			X		
Seibt et.al. (1995)	X					X	
Sherr et.al. (2000)		X			X		
Shuter et.al. (2012)		X		X	X		
Simoni & Cooperman (2000)		X			X	X	
Stein & Nyamathi (2000)		X			X	X	
Stein et.al. (2009)	X	X		X	X	X	
Taylor et.al. (2017)	X				X		
Thomason et.al. (1996)		X			X	X	
Tuck et.al. (2001)		X			X	X	

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Visintini et.al. (1995)	X	X		X		
Webb et.al. (2007)	X		X	X	X	
Wilkie et.al. (1992)		X	X	X		
Woods et.al. (1992)	X			X		

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Table 5

Journal Types

Author (Year) n = 62	Medical Journal	Psychiatric Journal	Psychology Journal	Social Sciences Journal	Other
Adelekan et.al. (1995)	X				
Antoni et.al. (1991)			X		
Auerbach, Oleson, & Solomon et.al. (1992)			X		
Barbanti et.al. (2008)	X				
Bartos & McDonald (2000)	X				
Blaney et.al. (1991)			X		
Blaney et.al. (1990)			X		
Blaney et.al. (1991)			X	X	
Blashill et.al. (2014)			X		
Calveti et.al. (2014)					SciELO
Catalan & Meadows (2000)	X				
Ceballos-Capitaine et.al. (1990)				X	
Chesney et.al. (2000)	X				
Chitwood et.al. (2000)	X				
Cook et.al. (2016)	X				
Cortes et.al. (2014)	X				
Dekker & Mootz (1992)			X		
Dowsett et.al. (1992)			X		
Faugier & Cranfield (1995)	X				
Franke et.al. (1992)			X		
Goldstone et.al. (1995)	X				
Goodkin et.al. (1992)			X		
Grassi et.al. (1995)	X				
Hallfors et.al. (2012)				X	
Harrowing & Mill (2010)	X				
Herrman et.al. (2008)	X				
Ironson et.al. (1990)			X		

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Jiao et.al. (2016)	X			
Johnson-Masotti et.al. (2000)	X			
Ka'opua & Mueller (2004)			X	
Kennedy et.al. (1995)	X			
Klimas et.al. (1991)	X			
Knippels & Weiss (2000)	X			
Knippels et.al. (2002)	X			
Letteney et.al. (2012)			X	
Malee et.al. (2014)	X			
Malotte et.al. (2000)	X			
Marquine et.al. (2014)		X		
Millar et.al. (2017)	X			
Morin et.al. (1995)	X			
Mulder et.al. (1995)			X	
Mulder et.al. (1999)			X	
Mulder et.al. (1994)	X			
Page (1990)			X	
Remien et.al. (1992)			X	
Rey et.al. (1995)	X			
Rosso et.al. (2012)	X			
Rotily et.al. (1995)	X			
Sale & Gadanya (2008)			X	
Seibt et.al. (1995)	X			
Sherr et.al. (2000)	X			
Shuter et.al. (2012)	X			
Simoni & Cooperman (2000)	X			
Stein & Nyamathi (2000)	X			
Stein et.al. (2009)				American Journal of Men's Health
Taylor et.al. (2017)				Archives of Sexual Behavior
Thomason et.al. (1996)			X	

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Tuck et.al. (2001)				JAN: Informing Practice and Policy Worldwide through Research and Scholarship
Visintini et.al. (1995)	X			
Webb et.al. (2007)			X	
Wilkie et.al. (1992)	X			
Woods et.al. (1992)		X		

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Table 6

Application of Biopsychosocial Model

<i>Author (Year)</i> <i>n = 62</i>	Biopsychosocial Model-Strong (3)	Biopsychosocial Model-Moderate (2)	Biopsychosocial Model-Minimal (1)	Biopsychosocial Model-None (0)
Adelekan et.al. (1995)				X
Antoni et.al. (1991)			X	
Auerbach, Oleson, & Solomon et.al. (1992)		X		
Barbanti et.al. (2008)			X	
Bartos & McDonald (2000)				X
Blaney et.al. (1991)			X	
Blaney et.al. (1990)			X	
Blaney et.al. (1991)				X
Blashill et.al. (2014)			X	
Calvetti et.al. (2014)		X		
Catalan & Meadows (2000)				X
Ceballos-Capitaine et.al. (1990)			X	
Chesney et.al. (2000)				X
Chitwood et.al. (2000)			X	
Cook et.al. (2016)	X			
Cortes et.al. (2014)				X
Dekker & Mootz (1992)				X
Dowsett et.al. (1992)				X
Faugier & Cranfield (1995)				X
Franke et.al. (1992)				X
Goldstone et.al. (1995)				X
Goodkin et.al. (1992)		X		
Grassi et.al. (1995)			X	
Hallfors et.al. (2012)			X	
Harrowing & Mill (2010)			X	

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Herrman et.al. (2008)		X	
Ironson et.al. (1990)		X	
Jiao et.al. (2016)		X	
Johnson-Masotti et.al. (2000)			X
Ka'opua & Mueller (2004)			X
Kennedy et.al. (1995)		X	
Klimas et.al. (1991)			X
Knippels & Weiss (2000)			X
Knippels et.al. (2002)			X
Letteney et.al. (2012)	X		
Malee et.al. (2014)	X		
Malotte et.al. (2000)			X
Marquine et.al. (2014)		X	
Millar et.al. (2017)	X		
Morin et.al. (1995)			X
Mulder et.al. (1995)		X	
Mulder et.al. (1999)		X	
Mulder et.al. (1994)		X	
Page (1990)			X
Remien et.al. (1992)		X	
Rey et.al. (1995)			X
Rosso et.al. (2012)		X	
Rotily et.al. (1995)			X
Sale & Gadanya (2008)		X	
Seibt et.al. (1995)			X
Sherr et.al. (2000)			X
Shuter et.al. (2012)		X	
Simoni & Cooperman (2000)			X
Stein & Nyamathi (2000)			X
Stein et.al. (2009)	X		
Taylor et.al. (2017)		X	
Thomason et.al. (1996)		X	

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Tuck et.al. (2001)		X	
Visintini et.al. (1995)			X
Webb et.al. (2007)	X		
Wilkie et.al. (1992)			X
Woods et.al. (1992)			X

Note. The application of the biopsychosocial model was based on the amount of times the model was referenced in the article. Another determinant was whether the articles were used as a reference for future articles to use in their analysis of the biopsychosocial model and its benefits on people living with HIV.