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Effects of Individualized Acupuncture on Sleep Quality in HIV Disease

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Although it may begin at any point, sleep disturbance often appears early in HIV disease and contributes to decreased quality of life during the course of the illness. Relatively few studies have explored the complex nature of poor sleep quality in HIV disease or tested interventions to improve sleep quality. The purpose of this study was threefold: explore the nature of sleep quality in HIV disease, test the relationship between pain and sleep quality, and test the effectiveness of acupuncture delivered in a group setting for improving sleep quality in those who are HIV infected. A pretest, posttest, preexperimental design was used to test the effects of acupuncture on sleep quality. Participating in the study were 21 HIV-infected men and women between the ages of 29 and 50 years who reported sleep disturbance three or more times per week and who scored greater than 5 on the Pittsburgh Sleep Quality Index. The Wrist Actigraph was used to measure sleep activity, and the Current Sleep Quality Index was used to measure sleep quality for 2 nights before and after a 5-week acupuncture intervention (10 treatments). Acupuncture was individualized to address insomnia and other symptoms reported by the participants. Sleep activity and sleep quality significantly improved following 5 weeks of individualized acupuncture delivered in a group setting.

Key words: *HIV/AIDS, insomnia, acupuncture, sleep*

Disrupted sleep quality is a frequent symptom of HIV infection (Cohen, Ferrans, Vizgirda, Kunkle, & Cloninger, 1996; Nokes & Kendrew, 1996) that contributes to fatigue, disability, eventual unemployment (Darko, Mitler, & Miller, 1998), and decreased quality of life (Cohen et al., 1996; Nokes, Chidekel, & Kendrew, 1999). Rubinstein and Selwyn (1998) found that 84 (73%) of 115 HIV-seropositive patients attending an outpatient HIV/AIDS clinic at an urban teaching hospital were classified as having a sleep disorder as measured by the Pittsburgh Sleep Quality Index (PSQI).

Sleep quality is dynamic and is influenced, positively and negatively, by a multitude of physiological, psychological, emotional, psychosocial, and pharmacological factors. The HIV envelope glycoprotein 120 (gp120) induces the secretion of cytokines, such as interleukin-1 (IL-1), interleukin-6 (Il-6), and tumor necrosis factor-alpha (TNF-α), which enhance or suppress sleep (Opp et al., 1996; Raymon, Kimes, Tabakoff, & London, 1989). Serum levels of these three proinflammatory cytokines, IL-1, IL-6, and TNF-α, are elevated during stress (Maes et al., 1999) and are higher in the blood of HIV-infected individuals (Darko et al., 1995; Fauci, 1993). IL-1, IL-6, and TNF-α activate the hypothalamic-pituitary-adrenal axis and stimulate the secretion of hormones that are important in initiating, maintaining, and ending sleep (Chrousos, 1995). Stress may accelerate disease progression by increasing the rate of viral replication, suppressing immunity, and inducing behaviors that are harmful to health (Robinson, Mathews, & Witek-Janusek, 2000). Symptoms of opportunistic infections that occur as HIV disease progresses often result in sleep disturbance. Pain is one such symptom asso-

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ciated with sleep disturbance, which continues to be a major source of suffering and concern for persons with HIV disease (Newshan & Sherman, 1999; Newshan & Wainapel, 1993). A number of psychosocial factors have the potential to disrupt sleep by the release of cortisol during acute and chronic stress. Two emotions frequently experienced in HIV disease, anxiety and depression, are significantly related to sleep disturbance (Fuller, Waters, Binks, & Anderson, 1997). Even the antiretrovirals that are beneficial in treating HIV disease often have insomnia as a side effect (Phillips, 1999). Despite the negative effects of insomnia on well-being in HIV disease, research that addresses the nature of insomnia in HIV disease and interventions to treat this symptom remains modest.

Complementary therapies are being used more frequently in the United States (Eisenberg et al., 1993), and HIV-infected men and women have increasingly turned to complementary therapies (Fairfield, Eisenberg, Davis, Libman, & Phillips, 1998; MacIntyre & Holzemer, 1999). Acupuncture (ACU) is one complementary therapy that is frequently used for symptom management. Greene and colleagues (1999) reported that 48% of a sample of 1,016 HIV-infected participants reported using needle ACU to treat their symptoms. ACU has been endorsed by the World Health Organization for 43 diseases for which it has demonstrated effectiveness (Institute for Alternative Futures, 1998; Office of Alternative Medicine, 1994). A few studies have demonstrated the effectiveness of ACU for improving sleep quality (Croke & Bourne, 1999; Montakab, 1999). However, the effectiveness of ACU for treating insomnia in HIV-infected individuals has not been tested. The purpose of this study was threefold: explore the nature of sleep quality in people with HIV disease, test the relationship between pain and sleep quality, and test the effectiveness of ACU delivered in a group setting for improving sleep quality in those who are HIV infected.

Background

Insomnia

Insomnia, the most common of all sleep disorders, refers to unsatisfactory duration, efficiency, or quality of sleep that is experienced 3 or more nights per week. Insomnia negatively affects physical, psychological, and social well-being. Both sleeping too much and sleeping too little correlate with increased mortality in conditions other than HIV/AIDS (Hammond, 1964; Kojima et al., 2000; Newman et al., 2000). Salient characteristics of chronic insomnia are presented in Table 1.

Table 1. Salient Features of Chronic Insomnia

- Subjective complaints of poor sleep
- Difficulties in initiating sleep (sleep latency greater than 30 minutes)
- Difficulties in maintaining sleep (wake time after going to sleep is greater than 30 minutes)
- Sleep efficiency is less than 85% (total sleep time/total time in bed × 100)
- Sleep difficulties 3 or more times per week
- Insomnia persists for greater than 6 months
- Daytime sleepiness
- Daytime fatigue
- Performance impairment
- Mood disturbances
- Impaired social functioning
- Impaired occupational functioning
- Marked physical, psychological, or emotional distress

Sleep Quality in HIV Disease

Insomnia has been reported across all stages of HIV disease (Ferini-Strambi et al., 1995; Norman, Chediak, Kiel, & Cohn, 1990; Rothenberg, Zozula, Funesti, & McAuliffe, 1990). Sleep disturbances may even serve as an early marker of HIV disease (Norman et al., 1992; White et al., 1995). The inverse relationship reported between frequency of sleep complaint and CD4+ T cells suggests that sleep disturbance increases as the disease progresses (Rothenberg et al., 1990). Sleep disturbances have been found to occur more frequently in persons with AIDS (Norman, 1990).

Normal Sleep Architecture

Sleep architecture, the progression through the stages of sleep, was first demonstrated with the advent of the electroencephalogram (EEG) in 1928. Normal sleep consists of rapid eye movement (REM) sleep and non-rapid eye movement (NREM) sleep. When a person is awake the EEG shows a very rapid, low voltage wave pattern. Sleep occurs in four stages. As a person moves through the stages of sleep, the frequency decreases (slows) and the amplitude (voltage) increases. In Stage I and Stage II, the brain waves are faster with low voltage. In Stages III and IV, the brain waves are slower, and the amplitude is higher. Stages III and IV are known as the period of slow-wave sleep (SWS). At the onset of normal sleep, the person progresses from Stage I to Stage IV. When the person completes Stage IV sleep, the person moves from Stage IV through Stage III and Stage II to a period of REM sleep. Each of these cycles requires about 90 minutes (Hobson, 1989).

Sleep Architecture Changes in HIV Disease

Ferini-Strambi and colleagues (1995) found significant decreases in SWS and a higher cyclic alternating pattern of sleep in HIV disease, suggesting that HIV-infected individuals have difficulty achieving deeper levels of sleep. It appears that HIV infection may distort both REM and NREM sleep cycles, increase the total percentage of SWS, and move SWS to the last half of the sleep period (Henriksen et al., 1995). Relationships between SWS and immunity have been observed, suggesting that sleep disturbances adversely affect immunity through complex relationships of the sleep hormones and immune cells (Darko, McCutchan, Kripke, Gillin, & Golshan, 1992; Krueger, Obal, Johannsen, Cady, & Toth, 1989; Moldofsky, Lue, Davidson, & Gorczynski, 1989; Moldofsky, Lue, Eisen, Keystone, & Gorczynski, 1986; Toth & Krueger, 1990). Stress and sleep deprivation activate the hypothalamic-pituitary-adrenal axis, which results in the production of cortisol, a hormone that induces immune system dysregulation.

Darko et al. (1998) studied fatigue and sleep disturbance in 112 gay men (62 HIV positive and 50 HIV negative). They found that poor sleep, daytime fatigue, and loss of cognitive ability exist during all stages of HIV disease. In their study, significantly greater sleep disturbance was observed in the HIV-positive sample. Differences in sleep architecture were observed between the two groups. Growth hormone dysregulation is an important factor in the pathogenesis of HIV disease and may contribute to the wasting syndrome. Pulses of growth hormone are positively related to delta wave sleep (slow-wave sleep) (Luboshitzky, 2000). Coupling between delta-frequency sleep amplitude (slow-wave sleep) and growth hormone secretion was observed in both groups (HIV positive and HIV negative). However, the phase coupling was in opposite directions in the two groups in that the secretion of growth hormone was not as great during SWS in the HIV-positive group as in the HIV-negative group. This suggests that the brain's coordination of sleep deteriorates early in HIV disease; in part, this may explain the sleep disturbances that are experienced by asymptomatic HIV-infected persons. The researchers concluded that both fatigue and sleep disturbance contributed to mortality and morbidity in the HIV-positive subjects. Darko and colleagues concluded that cognitive dysfunction in early HIV infection appears to be more related to sleep loss and similar factors than to actual neurological impairment.

Other researchers have reported similar changes in sleep architecture. Wheatley and Smith (1994) found that HIV-positive patients reported greater delay in sleep onset, earlier morning awakening, more frequent nocturnal awakenings, and poorer well-being on waking. Using nocturnal sleep EEG as the measure of sleep, Wiegand and associates (1991) reported longer sleep onset latency, reduced total sleep time, reduced sleep efficiency, and more time spent awake in HIV-infected individuals. More time was spent in Stage I and Stage II sleep than in the deeper stages of sleep (Stages III and IV). In their study, sleep parameters did not differ significantly by stage of HIV disease. The changes in sleep quality manifested by these reported changes in sleep underscore the significance of research that addresses interventions aimed at improving sleep quality in persons with HIV disease.

Pain and Sleep in HIV Disease

A number of studies indicate that pain is a prevalent problem for persons with HIV disease (Lebovits et al., 1989; Newshan & Wainapel, 1993; Schofferman, 1988; Singh, Fermie, & Peters, 1992). The etiologies of pain experienced in HIV disease include abdominal pain, neuropathic pain, esophagitis, headache, cutaneous Kaposi's sarcoma, back pain, bone and joint pain, and postherpetic pain (Newshan & Wainapel, 1993). Pain contributes to the nonrestorative sleep experienced by persons with HIV disease (Gardner, Petrin, Collier, & Paauw, 1997). Harrison, Soong, Weiss, Gnann, and Whitley (1999) found that baseline postherpetic pain (Herpes zoster) significantly predicted the return to normal daily activities and sleep.

Acupuncture

ACU, in Western culture, is considered a complementary therapy; however, in many regions of the world, ACU is the standard of care that has been practiced for more than 3,000 years. ACU requires the insertion of very fine needles into the body's surface at specific sites. The purpose of ACU is to restore physiological, psychological, and emotional functioning. Controlled studies have demonstrated the beneficial effects of ACU for a number of conditions that include low back pain, headache, face and neck pain, musculoskeletal pain due to osteoarthritis, nausea and vomiting, and addiction (Institute for Alternative Futures, 1998). In addition, there is empirical evidence that ACU is beneficial in peripheral neuropathy associated with HIV disease (Galantino, Eke-Okoro, Findley, & Condoluci, 1999).

Acupuncture and Sleep

ACU has demonstrated effectiveness in improving sleep quality. In a controlled study of 32 participants with sleep disturbance, Becker-Carus, Heyden, and Kelle (1985) found a significant decrease in the amount of time required to fall asleep and frequency of waking up in those receiving ACU. Buguet, Sartre, and Le Kerneau (1995) studied the effects of ACU on sleep quality in six healthy volunteers. Following ACU, the number of cyclic alternating patterns of sleep as measured by EEG decreased. There was a decrease in nighttime wakefulness and an increase in non-REM sleep during nighttime sleep. Montakab (1999) randomized 40 subjects with a primary sleep disorder (insomnia) into two groups. One group received true ACU, and the other group received sham ACU. Sleep quality improved significantly in the group receiving true ACU. Studies that examine the effects of ACU on sleep quality are often limited by small sample sizes, test subjective appreciation of sleep, and do not objectively measure sleep (Montakab & Langel, 1994). Because HIV-infected persons use ACU and other complementary therapies with greater frequency than the general population, controlled studies of the safety and efficacy of such treatments in this population are warranted. Most research studies of the effects of ACU on sleep quality have used a uniform pattern of needle-insertion sites. However, in their practices, acupuncturists select insertion points based on the symptoms expressed by their clients. The intervention in this study was individualized to holistically treat the symptoms expressed by the participants. The decision to alter the needle-insertion sites according to each participant's needs was based on the belief that sleep quality is greatly influenced by other symptoms and that holistic treatment may be more effective in improving sleep quality. Prior research studies suggest that ACU may be effective in treating sleep disturbance; however, further research is needed.

Methods

This study used a pretest/posttest preexperimental design to examine whether ACU delivered in a group setting would improve sleep quality in individuals with HIV/AIDS. A purposive sample of 23 persons was recruited from an AIDS support organization and a private medical practice in Columbia, South Carolina. Purposive sampling was used to assure that all participants experienced some degree of sleep disturbance. Participants were HIV seropositive and between the ages of 21 and 50 years. Participants were included if they reported sleep disturbance three or more times per week as operationalized by three items that asked them to report whether they had difficulty getting to sleep, remaining asleep, or waking up early three or more times per week. The participants were able to read and write English at a sixth grade level or above. Only participants who scored greater than 5 on the PSQI were included in the study. Prospective participants were eligible to participate if they had not started, stopped, or changed doses of sedatives or analgesics within the previous 30 days.

Sample

Twenty-three subjects were enrolled in the study. One person died; one person left the study prior to completion due to driving distance. The final sample consisted of 21 HIV-positive individuals who range in age from 29 to 50 years ($M = 41.7$, $SD = 6.6$). Most (n = 11, 52%) of the participants lived alone, and most (n = 17, 81%) of them usually slept alone. Whereas 17 (81%) participants reported frequent problems getting to sleep, 15 (71.4%) reported frequent problems staying asleep, and 15 (71.4%) reported frequent problems with waking up early. The demographic characteristics of this sample are further described in Table 2.

The most frequent self-care activities to promote sleep reported by the participants were reading (n = 13), watching television (n = 17), exercising (n = 7), taking food at bedtime (n = 13), drinking warm milk (n = 4), drinking alcohol (n = 6), taking prescription drugs (n = 12), having sexual intercourse (n = 9), and masturbating (n = 6). Only one person had received ACU prior to this study and that was in the distant past.

Table 2. Demographic Characteristics of the Sample

Characteristic	Frequency	Percentage
Gender		
Male	13	62
Female	7	33
Transgendered	1	5
Sexual identity		
Male homosexual	10	48
Heterosexual	8	38
Bisexual	1	5
No response	2	10
Race		
Black	10	48
White	2	10
Other	2	10
No response	7	33
Education		
Less than high school	2	10
High school	8	38
Some college	7	33
College	1	5
Graduate school	2	10
Income adequacy		
Very adequate	1	5
Adequate	7	33
Inadequate	9	43
Very inadequate	4	19
Route of infection		
Sexual intercourse	18	85
Transfusion	1	5
Accidental exposure	1	5
Other	1	5
Health		
Excellent	2	10
Good	6	29
Fair	10	48
Poor	3	14

Instruments

PSQI. The PSQI, a self-report instrument that measures sleep quality, was used to screen prospective participants for significant sleep disturbance and for eligibility to participate. The PSQI contains 19 self-report items and 5 items that are rated by a roommate or bed partner and that pertain to sleep quality. The PSQI gives a global score of sleep quality. In addition, seven component scores can be obtained: (a) subjective sleep quality, (b) sleep latency, (c) sleep duration, (d) habitual sleep efficiency, (e) sleep disturbances, (f) use of sleeping medication, and (g) day- time dysfunction. The PSQI demonstrated internal consistency with a Cronbach's α of .83. Stability over time has been demonstrated by test-retest reliability (r = .85, p = .001). Completion of the PSQI requires 5 to 10 minutes. Possible total scores range from 0 to 21. A higher score indicates a greater degree of sleep disturbance. A PSQI global score greater than 5 indicates severe difficulties in at least three areas or moderate difficulties in more than three areas (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). Only those who scored greater than 5 on the PSQI were included in the present study.

Wrist actigraph (WA). The WA (manufactured by Ambulatory Monitoring, Ardsley, New York) was used to measure sleep activity. The WA is a device about the size of a wristwatch that can be worn on the wrist, torso, or legs during sleep. The instrument detects motion using a piezoelectric transducer. Mechanical signals are converted to electric signals. The WA facilitates measurement of sleep in one's own natural environment, is less expensive than overnight polysomnography, and does not require participant observation during sleep. Data are downloaded from the WA to a microcomputer. The WA allows estimation of (a) sleep-onset latency, (b) wake-after-sleep onset, (c) total sleep time, and (d) total recording time. Mullaney, Kripke, and Messin (1980) tested the reliability and validity of the WA in 102 sleep recordings obtained from 32 hospitalized patients and 53 persons from a heterogeneous population. Polysomnography, consisting of electroencephalography (EEG), electrooculography (EOG), and electromyography (EMG), was used as the gold standard. Total sleep time (r = .89, p = 0.0001), total sleep period (r = .90, p = 0.0001), wake-after-sleep onset (r = .70, p = .0001), and the number of midsleep awakenings (r = .25, p = .0001) as measured by polysomnography and the WA were found to be significantly related. Cole, Kripke, Gruen, Mullaney, and Gillian (1992) found sleep percentage (r = .82, p = .0001) and sleep latency (r = .90, p = .0001) as measured by the WA and polysomnography to be significantly correlated.

Current Sleep Quality Index (CSQI). Subjective sleep quality was measured using the CSQI. The CSQI was adapted and modified from the PSQI to measure an individual's last night's sleep and contains 27 items (Phillips, 1996). Both the PSQI and the CSQI use a combination of open-ended and Likert-type items. Examples of the items of the CSQI include the following: What time did you go to bed last night? Did it take you more than 30 minutes to fall asleep? How many times do you remember waking up last night? What time did you wake up this morning? What time did you get out of bed this morning? The CSQI asks the individual to rate the overall quality of their last night's sleep as *very good*, *good*, *fair*, *bad*, or *very bad*. In addition to a global score, components of the CSQI include time of going to bed, sleep latency, number of awakenings, number of times out of bed, overall sleep quality, reasons for poor sleep, and self-care behaviors to promote sleep. A pilot study was conducted by one of the researchers in this study to test the reliability of the CSQI. In a heterogenous sample of 75 participants, the mean global score for the CSQI was 5.7 (SD = 3.4) and 6.1 (SD = 3.8) for the PSQI. In that pilot study, Cronbach's α was 0.79 for the PSQI and 0.72 for the CSQI. The CSQI is considered to have content validity in that it was modified from an existing reliable and valid instrument to measure sleep quality (Buysse et al., 1989).

Pain Rating Scale. Pain intensity was measured using the Pain Rating Scale, a visual analog scale with anchors ranging from 0 = *no pain* to 10 = *worst pain I have ever had* (Clarke & Spear, 1964). Participants were asked to rate their least pain in the last 24 hours, their worst pain in the last 24 hours, and their current pain. Regardless of the particular scale used, subjective ratings of pain intensity are considered valid (McGuire, 1992). Test-retest reliability (r = .95, p < .001) has been demonstrated for visual analog scales that measure pain intensity (Revill, Robinson, Rosen, & Hogg, 1976). Visual analog scales may be more reliable in measuring changes in an individual's experience of pain than in comparing pain experience across groups, making them popular in studies of treatment outcomes (McGuire, 1992). Littman, Walker, and Schneider (1985) found a high degree of correlation (r = .89 to .93) between a visual analog scale, verbal descriptor scale, and a verbal pain relief scale. Reliability of visual analog scales may be better to measure chronic pain in better educated individuals who do not have impaired motor coordination (McGuire, 1992). Composites of 0 to 10 ratings, such as the one described, maximize reliability in clinical settings where detecting changes of pain intensity in individuals is needed (Jensen, Turner, Romano, & Fisher, 1999).

Demographic Data Form (DDF). An 18-item DDF was used to describe the sample. Specific questions addressed personal characteristics such as age, race, gender, education, relationship status, bed partners, income, route of infection, and medications. In addition, participants were asked how often they usually had problems getting to sleep, staying asleep, or getting enough sleep. These items were used for descriptive purposes.

Procedure

The researchers conducted an information session at the AIDS support organization to describe ACU and the nature of the study. An announcement regarding the information session was mailed out to all the clients of the AIDS support organization in their monthly newsletter. Forty-five persons attended that information session. Individuals who were interested in participating in the study were asked to contact one of the researchers. At a subsequent meeting, potential participants were fully informed of the nature of the study and were asked to sign and return an informed consent sheet. Each participant was asked to complete the PSQI and the DDF to determine eligibility for the study. Only those who scored greater than 5 on the PSQI and met the inclusion criteria for the study were asked to participate. Twenty-three individuals were included in the study. Participants were instructed regarding the purpose and the use of the WA. The WA was initialized by the researcher and placed on the participant's arms. Participants wore the WA and completed the CSQI for 2 nights before and 2 nights after the intervention

Intervention. The participants received ACU 2 evenings per week for 5 weeks for a total of 10 sessions. This time frame was considered theoretically valid based on Montakab's (1999) study of the effects of ACU on insomnia, in which a sample of 40 participants (20 true ACU and 20 sham ACU) received 3 to 5 sessions of ACU at weekly intervals. Using polysomnography, the participants receiving true ACU, but not those receiving sham ACU, demonstrated significant improvements in sleep. In fact, the participants in the present study received twice as many ACU interventions over the same time period as the participants in Montakab's study.

One of the researchers, a certified acupuncturist, performed ACU in a group session in a large room. Participants were seated in comfortable chairs in an ambient environment. Participants had access to pillows for use behind their head or back, on their lap for their arms, or under their feet. Soft background music was played to facilitate relaxation. Needle-insertion sites were prepared with alcohol before each treatment. Unlike other studies of the effectiveness of ACU on sleep, each patient received individualized ACU treatments that focused on specific needs and symptoms that the individual was experiencing. The rationale for this intervention was to test ACU as it is usually performed in practice. Point selection was based on the general principles of ACU and traditional Chinese medicine (East Asian Medical Studies Society, 1985). The treatment was modified over the course of the study to accommodate the individual's changing pattern of sleep, pain, or other health issues. Sterile, disposable ACU needles were used. Whereas more than 2,000 ACU points have been documented, the treatment used only main or common points located below the elbows and knees and on the head, neck, and ears (Table 3). When treating body points, tenderness, twitching, tension, referred pain, or other sensations determined if a point was used. Nonreactive points were not used.

The effectiveness of ACU in improving sleep quality may be greater when treatment is rendered in a holistic manner and is directed toward all symptoms being experienced. When treating symptoms other than sleep disorder (i.e., nausea, pain, or peripheral neuropathy), distal points were chosen that would have additional benefits for these conditions. Each treatment consisted of 10 or 15 needles that were left in situ for 30 to 45 minutes. During the treatment, patients were encouraged to relax and to breathe deeply. The lighting of the room was dimmed slightly. Members of the research team were present to address questions and assist as needed. Needles were removed, counted, and discarded in an appropriate container using universal precautions.

Results

At the beginning of the study, the participants were asked to describe their sleep during the previous 30 days using the PSQI. The mean global score for the PSQI was 12.8 (range = 7 to 18, $SD = 3.3$). Participants were asked to rate the frequency with which they experienced problems getting to sleep, staying asleep, and getting enough sleep (Table 4).

Because pain ratings are ordinal level data, relationships between subjective ratings of pain and sleep quality were tested using Spearman's rho (ρ). Significant

Table 3. Acupuncture Points Used in This Study

Number	Name	Location	Indications
Standard acupuncture points			
HE-7	Shenmen Spirit Gate	Lies in the depression at the upper border of the pisiform bone of the wrist joint, on the right radial side of flexor carpi ulnaris	Insomnia Agitation Heat in palms
SP-6	Sanyinjiao Three Yin Intersection	Lies on the medial aspect of the lower leg, 3 cun[a] above the prominence of the medial malleolus in a depression close to the medial crest of the tibia	Insomnia Heat in the soles of the feet Lower leg pain
KI-3	Taixi Supreme Stream	Lies in the depression between the medial malleolus and the Achilles' tendon at the level of the prominence of the medial malleolus	Insomnia Lower leg pain Lower leg numbness
P-6	Neiguan Inner Pass	Lies on the ventral aspect of the forearm, between the tendons of palmaris longus and flexor carpi radialis, 2 cun above the crease of the wrist	Insomnia Fever Upper arm pain Nausea
Auricular acupuncture points			
N/A	Neurogate	Lies in the triangular fossa, superior and medial to the intersection of the superior and inferior crura of the antehelix	Pain
N/A	Heart	Lies in the depression at the center of the cavum of conchae	Circulation Sedation Calming
N/A	Lungs	Lies 1/4 inch above and just below the center of the cavum of conchae	Circulation Abnormal respirations Pain
N/A	Sympathetic	Lies at the intersection of the upper border of the inferior crus of the antehelix and the medial border of the helix	Pain Circulation
Acupuncture points for peripheral neuropathy of the upper extremities			
LU-9	Taiyuan Supreme Abyss	Lies at the wrist joint, in the depression between the radial artery and the tendon of abductor pollicis longus, level with the upper border of the pisiform bone	Pain in wrist and arm Heat in palm
LI-4	Hegu Joining Valley	Lies on the dorsal surface of the hand, between the first and second metacarpal bones, at the midpoint of the second metacarpal bone and close to its radial border of the second metacarpal near the radial border	Pain in arm and hand Contraction of fingers Fever
LI-11	Quchi Pool at the Crook	Lies at the elbow, midway between the tendon of biceps brachii and the lateral epicondyle of the humerus, at the lateral side of the transverse cubital crease	Fever Arm pain Arm numbness Swelling of arm and ankle
TH-5	Waiguan Outer Pass	Lies between the radius and the extensor digitorum communis tendons, close to the radial border	Pain in head and neck Pain in shoulder, elbow, arm, hand Fever Arm numbness
Acupuncture points for peripheral neuropathy of the lower extremities			
ST-36	Zusanli Leg Three Miles	Lies three cun below the lateral depression of the patella and approximately one cun lateral to the tibia	Heaviness of limbs Head pain Pain in leg and foot Muscle pain
ST-41	Jiexi Release Stream	Lies at the midpoint of the transverse crease on the anterior ankle, between the tendons of extensor hallucis longus and extensor digitorum longus at the level of the prominence of the lateral malleolus	Pain in leg, ankle, foot Swelling of ankle, foot Headache
N/A	Bafeng Eight Winds	Lies on the dorsal surface of the foot, between the toes 1/2 cun proximal to the margin of the web	Pain in foot Swelling in foot Headache

a. Cun is a proportional unit of measurement traditionally used in acupuncture. One cun is the width of the patient's interphalangeal joint. Three cun is the width of the patient's hand.

relationships were found between sleep quality and the most pain during the previous 24 hours ($\rho = .61$, $p = .01$), least pain during the previous 24 hours ($\rho = .66$, $p = .00$), and present pain ($\rho = .61$, $p = .01$).

Sleep/wake activity was measured using the WA. Total sleep time in the 48 hours of the posttest increased by an average 234 minutes (3.9 hours), almost 2 hours per day. Sleep quality was tested using multiple analysis of variance (MANOVA) to control for experiment-wise error rate. Differences between the pretest and posttest scores were entered into a MANOVA model for amount of sleep in minutes, the number of minutes spent awake, sleep percentage, wake percentage, and sleep ratio. Significant improvements in sleep quality were demonstrated when Wilks's lambda was performed, $F(7, 7) = 6.81$, $p = .01$. Univariate analyses revealed statistically significant differences for the amount of sleep in minutes, $F(1, 13) = 4.67$, $p = .05$; the number of minutes spent awake, $F(1, 17) = 4.67$, $p = .05$; sleep percentage, $F(1, 13) = 4.66$, $p = .05$; wake percentage, $F(1, 17) = 4.66$, $p = .05$; sleep ratio, $F(1, 17) = 4.81$, $p = .05$. The number of mid-sleep awakenings, $F(1, 17) = 0.01$, $p = .92$; the amount of time spent awake after each mid-sleep awakening, $F(1, 17) = 2.29$, $p = .15$; and sleep latency, $F(1, 17) = 0.03$, $p = .87$, did not significantly differ from pretest to posttest.

The total score of the CSQI was used to measure subjective sleep quality. Subjective sleep quality showed significant improvement from the pretest ($M = 10.5$, $SD = 4.4$) to the posttest ($M = 7.1$, $SD = 4.2$) ($t = –4.05$, $p = .001$).

Table 4. Participants' Description of Sleep Problems

Sleep Problem	*n*	Percentage
Problems getting to sleep		
Rarely	0	0.0
Occasionally	4	19.0
Frequently	9	42.9
Very frequently	8	38.1
Problems staying asleep		
Rarely	3	14.3
Occasionally	3	14.3
Frequently	8	38.1
Very frequently	7	33.3
Problems getting enough sleep		
Rarely	2	9.5
Occasionally	4	19.0
Frequently	5	23.8
Very frequently	10	47.6

Discussion

Participants in this study suffered from severe sleep disturbance. The majority of participants reported problems getting to sleep, staying asleep, and waking up early. The PSQI measures sleep quality over the previous 30 days. A global score that was greater than 5 on the PSQI indicates severe difficulties in at least three areas or moderate difficulties in more than three areas (Buysse et al., 1989). The mean score for participants in this study prior to the ACU intervention was 12.8 ($SD = 3.3$). The mean global score for the PSQI is substantially higher than that reported by Norman (1990). In her study, individuals with asymptomatic HIV disease reported a mean global score of 3.96 ($SD = 1.5$), and for persons with AIDS the mean global score was 9.46 ($SD = 4.8$). Nokes and Kendrew (1996) studied sleep quality in 56 HIV-infected people, of whom 29 (52%) were diagnosed with AIDS. In their study, the global score for the PSQI was 8.48 ($SD = 4$). The greater sleep disturbance reported in prior studies may be due to a number of factors. The significant relationships between sleep quality and least pain, greatest pain, and current pain indicate that pain was being inadequately managed for a number of the participants in the study. Another possible reason that sleep disturbance was greater in this study may be the fact that we purposively recruited and selected individuals who were experiencing greater sleep disturbance as the baseline.

Sleep quality was significantly related to the level of pain experienced by the participants of this study. Adequate pain relief is essential to promoting sleep. ACU has repeatedly demonstrated effectiveness as an adjunct to pain relief. The beneficial effects of ACU on sleep quality observed in this study may be related in part to pain relief.

Chinese medicine views sleep disorders in terms of the patterns of symptoms presented by the patient. In a group of patients presenting with sleep disorders, a practitioner would likely prescribe treatments based on the pattern of symptoms. To effectively treat insomnia in HIV disease, the practitioner must consider the patient holistically and treat other symptoms that contribute to insomnia. Most ACU studies have measured the effectiveness of a fixed selection of ACU points in the treatment of a specific ailment. ACU in practice, however, involves the development of an individualized ACU treatment. Patients presenting with the same chief complaint would likely receive very different selections of ACU points. This study evaluated ACU therapy as practiced by allowing the practitioner to act in a normal manner. Our findings are consistent with those of previous research indicating that ACU improves sleep quality (Croke & Bourne, 1999; Montakab, 1999).

Fees for ACU and many other complementary therapies are not reimbursed by many health care plans. Limited financial resources put these therapies out of the reach of many persons with HIV disease. Twelve participants were receiving prescribed sedative therapy, but they were still experiencing great sleep difficulty. Sleep quality significantly improved following the 5-week ACU intervention. This suggests that, in the long run, ACU might be a cost-effective means of providing symptom relief. Administering ACU in a group setting rather than individually may provide even a more cost-effective model for delivering ACU for individuals with limited financial resources.

Like most sleep studies, the number of participants in this purposive sample was small. However, for a number of reasons, most sleep studies are conducted in small samples. A sample of 21 in a pretest-posttest design demonstrated sufficient power (.80) to test the effects of ACU on sleep quality. The major limitation of this study is that it is a one-group design. Therefore, it is not possible to rule out that the observed effects are the result of a nonintervention effect, for instance, relaxation or a placebo effect. Future studies should be conducted in larger samples that are randomized into experimental and control groups. Given these limitations, the findings of this study suggest that this specific ACU intervention administered holistically in a group setting is an effective intervention for the insomnia experienced in HIV disease and warrants further investigation. Overall, total sleep time increased by almost 2 hours per day following the individualized ACU intervention.

Nursing Implications

Insomnia is a frequently encountered symptom of HIV disease that detracts from quality of life (Cohen et al., 1996; Darko et al., 1998; Nokes et al., 1999; Nokes & Kendrew, 1996). Every patient needs a holistic nursing assessment that explores the symptoms of HIV disease including sleep quality. It is important to consider the relationship of other symptoms to poor sleep quality. Adequate pain control is essential to improving sleep quality. Because sleep disturbances are frequent side effects of antiretrovirals and other medications used in the treatment of HIV infection, current medications should be considered when a patient complains of severe sleep disruption. Perhaps a change of a medication, or even of the time that it is administered, may significantly improve sleep quality.

Sedative hypnotics are not the only option and, quite often, may not be the best option for HIV-infected individuals who are experiencing insomnia. Sedative hypnotics are metabolized by the same hepatic system (cytochrome p450) that metabolizes many of the antiretrovirals (Phillips, 1999). Some HIV-infected individuals choose not to take sedative hypnotics because of prior substance use problems. Only 12 participants reported taking prescription drugs to promote sleep at the time of the study. Despite the use of prescription drugs to promote sleep, the participants continued to experience severe insomnia. This finding suggests that HIV-related insomnia is inadequately addressed in the treatment plan. Complementary therapies add a powerful adjunct to symptom relief. More and more, HIV-infected individuals have turned to complementary therapies for symptom relief, and increasingly, nurses have incorporated complementary therapies into the care they deliver. It is important for health care professionals to be well informed regarding available treatment options and complementary therapies that their patients may be using. The results of this study suggest that the ACU intervention that has been described may be an effective intervention for the relief of insomnia. Advanced practice nurses may want to consider recommending ACU to their HIV-infected patients who are experiencing chronic insomnia. Further study must be done to determine its effectiveness.

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