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Focus on Increasing Treatment Self-Efficacy to Improve Human Immunodeficiency Virus Treatment Adherence

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Abstract

Purpose—Human immunodeficiency virus (HIV) treatment self-efficacy is the confidence held by an individual in her or his ability to follow treatment recommendations, including specific HIV care such as initiating and adhering to antiretroviral therapy (ART). The purpose of this study was to explore the potential mediating role of treatment adherence self-efficacy in the relationships between Social Cognitive Theory constructs and self- reported ART adherence.

Design—Cross-sectional and descriptive. The study was conducted between 2009 and 2011 and included 1,414 participants who lived in the United States or Puerto Rico and were taking antiretroviral medications.

Methods—Social cognitive constructs were tested specifically: behaviors (three adherence measures each consisting of one item about adherence at 3-day and 30-day along with the adherence rating scale), cognitive or personal factors (the Center for Epidemiology Studies Depression Scale to assess for depressive symptoms, the 12-Item Short Form Health Survey (SF-12) to assess physical functioning, one item about physical condition, one item about comorbidity), environmental influences (the Social Capital Scale, one item about social support), and treatment self-efficacy (HIV Adherence Self-Efficacy Scale). Analysis included descriptive statistics and regression.

Results—The average participant was 47 years old, male, and a racial or ethnic minority, had an education of high school or less, had barely adequate or totally inadequate income, did not work, had health insurance, and was living with HIV/acquired immunodeficiency syndrome for 15 years. The model provided support for adherence self-efficacy as a robust predictor of ART adherence behavior, serving a partial mediating role between environmental influences and cognitive or personal factors.

Conclusions—Although other factors such as depressive symptoms and lack of social capital impact adherence to ART, nurses can focus on increasing treatment self-efficacy through diverse interactional strategies using principles of adult learning and strategies to improve health literacy.

Clinical Relevance—Adherence to ART reduces the viral load thereby decreasing morbidity and mortality and risk of transmission to uninfected persons. Nurses need to use a variety of strategies to increase treatment self-efficacy.

Keywords

HIV/AIDS; social cognitive theory; self-efficacy; adherence

Human immunodeficiency virus (HIV) infection has evolved into a chronic condition in regions of the world where healthcare systems provide treatment. HIV-acquired

immunodeficiency syndrome (AIDS) is now a chronic disease similar to other chronic illnesses such as diabetes and hypertension that require daily medications in order to control the associated pathology and optimize health (Volberding & Deeks, 2010). Regular adherence to antiretroviral therapy (ART) can reduce morbidity, mortality, and the likelihood of transmission of HIV to uninfected persons (Panel on Retroviral Guidelines for Adults and Adolescents, 2012). Irregular adherence, however, can result in viral mutations, which render classes of antiretroviral medications inefficient and, if the virus is transmitted to another person, increases the spread of resistant strains of HIV type 1. Recent developments have offered the possibility of once daily dosing, and pharmaceutical combinations include more than one active medication in one pill. This has significantly reduced adherence barriers related to complex regimen and dosing patterns. However, ART adherence remains challenging for many persons, and thus the benefits of ART are not fully realized (Phillips, 2011; Protopopescu et al., 2009). Approaches to optimizing medication adherence may be improved by placing medication adherence within the larger framework of chronic disease self-management.

Social Cognitive Theory suggests that perceived self-efficacy is a significant determinant of behavior that operates partially independently of underlying skills (Bandura, 1986). Effective chronic disease self-management requires considerable skills and is associated with improved outcomes, reduced mortality and disability, improved quality of life, and reduced healthcare costs (Richard & Shea, 2011). HIV treatment self-efficacy is defined as the confidence held by an individual in her or his ability to follow treatment recommendations and includes any actions that the person living with HIV does to promote health, including specific HIV care such as initiating and adhering to ART; attending health-related appointments; and more general health-promoting practices related to nutrition, exercise, and sleep, along with avoiding use or abuse of cigarettes, alcohol, and medications (Johnson et al., 2007). The purpose of this article was to explore the potential mediating role of treatment adherence self-efficacy in the relationship between Social Cognitive Theory constructs and ART adherence in a large sample of persons living with HIV or AIDS (PLWHA) in the United States and Puerto Rico taking ART to treat their HIV disease.

Self-efficacy has been described as an antecedent skill for optimum treatment adherence (Shay, 2008). If it can be demonstrated that self-efficacy is a mediator or antecedent to treatment adherence, then nursing interventions can focus on increasing self-efficacy rather than treatment of lifelong comorbid conditions such as depression or improving limited financial resources. By improving treatment self-efficacy and, therefore, adherence to ART, PLWHA will receive greater benefit from existing treatments and decrease the transmission of the virus to uninfected others.

Background

Adherence describes the complement of actions taken to comply with intervention recommendations and is different from other behavior change outcomes (McBride et al., 2012). Growing recognition by healthcare providers that consumers are not following recommendations has led to a proliferation of strategies to improve treatment adherence. Observations indicate that treatment adherence has been declining steadily, but perhaps consumers are becoming more open with their health-care providers about adherence behaviors. This transition in dialog about whether clients are adhering to recommendations as part of their decision making may symbolize a shift toward a shared patient-provider decision-making framework. Current methods of improving adherence for chronic health problems are complex, with limited effectiveness. Haynes, Ackloo, Sahota, McDonald, and Yao (2008) argue that high priority should be given to fundamental and applied research

concerning innovations to assist patients to follow recommended treatment options for chronic medical disorders.

Persons with higher initial levels of depression participating in chronic disease self-management programs had the greatest improvements in health distress compared to controls (Ritter, Lee, & Lorig, 2011). Factors related to treatment adherence for persons living with chronic illnesses include depression, social support, and self-efficacy (Shay, 2008). A meta-analysis of 12 studies of chronically ill patients, which did not include PLWHA, showed that depressed patients were three times more likely to be nonadherent with their medical treatment as nondepressed persons (DiMatteo, Lepper, Croghan, 2000). A meta-analysis found that depression and HIV treatment nonadherence has been consistent across samples over time and was not limited to clinical signs of depression (Gonzalez, Batchelder, Psaros, & Safren, 2011). Strong social support, especially practical support, was also related to better treatment adherence (DiMatteo, 2004) in chronically ill persons. In the United States and Puerto Rico, HIV infection has disproportionately impacted sexual minorities and injection drug user groups, both of whom have high rates of depression and limited social support. Men who have sex with men show higher rates of depression than other groups (Alvy et al., 2011), and injecting drug users often report limited social support and economic resources (Magnus et al., 2009).

Theoretical Framework

Social cognitive theory posits a model of triadic reciprocality where behavior, cognitive and other personal factors, and environmental influences operate interactively as determinants of each other (Bandura, 1986). Figure 1 presents the social cognitive triadic model with the three constructs and specific variables being tested and treatment self-efficacy as an antecedent mediator of the desired behavior: adherence to ART. Self-efficacy appraisals reflect the level of difficulty that individuals believe they can surmount to perform a specific behavior (Bandura, 2006); such as taking prescribed medications as directed by a healthcare provider.

Methods

Sample and Setting

Data for this cross-sectional secondary analysis come from the International Nursing Network for HIV/AIDS Research Study V: Exploring the Role of Self-compassion, Self-efficacy and Self-esteem for HIV-positive Individuals Managing Their Disease. In the primary study, there were 16 sites from five countries and Puerto Rico; data collection started in August 2009 and ended in July 2011, and each site recruited approximately 100 to 300 participants ($N = 2,182$). Inclusion criteria were: adults (>18 years of age), living with HIV/AIDS, and receiving services from infectious disease clinics or AIDS service organizations. Prior to recruitment at study sites, the Committee on the Protection of Human Subjects at the University of California, San Francisco, reviewed and approved the overall protocol, and each site also received approval from their local human subjects review committees.

This research study included 1,414 participants from the primary study who lived in the United States (California, Massachusetts, Washington, Illinois, New York, Ohio, North Carolina, Texas, Hawaii, and New Jersey) or Puerto Rico and who reported currently taking antiretroviral medications. The average participant was 47 years old, male, and a racial or ethnic minority, had an education of high school or less, had barely adequate or totally inadequate income, did not work, had health insurance, and was living with HIV/AIDS for 15 years (see Table 1 for additional information).

Data Collection Procedures

Each site adhered to the common protocol, and all participants gave written informed consent before completing a pen-and-paper, cross-sectional survey. After completing the survey, all data were entered into an electronic database using Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) programs and were de-identified. The de-identified data were sent to the coordinating center, cleaned, entered into the master database, and stored until all sites completed data collection and entry. Instruments were scored based on the instructions provided by the author. Original data were stored at each individual site.

Instruments

Treatment self-efficacy was measured by the HIV Adherence Self-Efficacy Scale (HIV-ASES) which assesses a person's confidence to carry out health-related behaviors (sticking to a treatment plan, including keeping appointments, adhering to medication) over the past month. This measure, which includes two subscales (Perseverance and Integration), has been associated with adherence to ART (Johnson et al., 2007; Webel et al., 2012). Subjects were asked, "How confident are you that you can. .." on 12 items, with ratings from 1 (*not at all confident*) to 10 (*totally confident*).

Cognitive and Other Personal Factors

Depressive symptoms were measured by the 20-item Center for Epidemiology Studies Depression Scale (CES-D), which is a widely used nondiagnostic screening tool that measures the current level of depressive symptoms in community populations (Radloff, 1977). Items are rated 0 = *never or rarely* to 3 = *mostly or all of the time*. A total score can range from 0 to 60.

Physical functioning was measured using the Medical Outcome Study–Short Form, which is a multipurpose generic measurement of health status that contains 12 items that measure eight aspects of general health to include physical functioning, role limitations due to physical health issues, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health (Jones et al., 2001; Ware, Kosinski, & Keller, 1995). The instrument uses a Likert scale of 1 to 3 for physical function items; 1 to 5 for bodily pain, social function, and general health perception items; 1 to 6 for vitality and mental health; and a dichotomous scale (yes or no) for the presence of role function items (Resnick & Nahm, 2001); higher scores indicate a better level of functioning.

Physical condition was measured with a single-item question asking participants about their perceived physical condition at the present time on a 10-point scale (1 = *very poor*, 10 = *excellent*). Comorbidity was measured by asking participants if they had other health conditions, such as tuberculosis, malaria, high blood pressure, diabetes, depression, or hepatitis, using a yes or no option and, if answered "yes," to list the comorbidity.

Environmental Influences

Social capital was measured on the Social Capital instrument, which has eight subscales, including participation in the local community, social agency, feelings of trust and safety, neighborhood connections, friends and family connections, tolerance of diversity, value of life, and workplace connections; these items were summed to create a total social capital score. In our analysis, the three workplace connections items were dropped, as were two work-related questions that are part of the social agency dimension, due to low anticipated employment status, since the average unemployment rate in persons living with HIV/AIDS ranges from 62% to 74% (Cunningham et al., 2006), with the approval and recommendation of the scale's authors. Participants were asked to rate each of the items on a 1–4 Likert-type

scale, with higher scores being consistent with more social capital (Onyx & Bullen, 2000; Webel et al., 2012). Social support was measured with one question asking participants about their current perceived social support on a 10-point scale (1 = *very poor*, 10 = *excellent*).

Behavior

The behavior of interest was taking ART and was measured with three items. These items included 3-day visual analog, 30-day visual analog, and 30-day adherence rating scales.

The 3-day Visual Analog Scale for Medication Adherence is a one-item visual analog scale that is based on Walsh and colleague's 30-day adherence assessment (Walsh, Mandalia, & Gazzard, 2002). Participants were asked to mark what percentage of the time they were able to take medications exactly as prescribed in the past 3 days, on a scale of 0% of the time to 100% of the time.

The 30-day Visual Analog Scale for Medication Adherence is a one-item visual analog scale adapted from Walsh and colleagues (Thames et al., 2011; Walsh et al., 2002). Participants were asked to mark what percentage of the time they were able to take medications exactly as prescribed by their doctor in the past 30 days, on a scale of 0% of the time to 100% of the time.

The 30-day Adherence Rating is a one-item self-rating of ability to take all medications as prescribed using a 6-point scale from "*very poor*" to "*excellent*." In a study of 643 visits by 156 study participants, Lu and colleagues (2008) compared both time frame and question format to data from Medication Event Monitoring System (MEMS) caps. Results showed that 1-month recall correlated more closely with MEMS caps than did 3- or 7-day recall. The study also found the 6-point scale to be more accurate than either frequency or percent responses.

Additional data were collected about demographic and illness-related characteristics, including age, gender, race, ethnicity, education, adequacy of income, health insurance, date first learned of HIV diagnosis, current CD4 T cell count, viral load, HIV transmission route, and general health. Table 1 present sample characteristics, and Table 2 presents the range, means, standard deviations, and Cronbach's α computed for this sample on each of the instruments used to measure the variables of interest.

Results

Treatment self-efficacy was operationalized by the concepts identified on the HIV-ASES. Johnson et al. (2007) reported two factors on the HIV-ASES (Integration and Perseverance), but a principal components factor analysis with this sample found one factor with an eigenvalue of 7.807, which explained 65% of the variance; therefore, further analyses were computed using a total score.

Adherence to ART was operationalized by a factor score created by saving the factor yielded by the three adherence items: percentage correctly taken in the past 3 days, percentage taken correctly in the past 30 days, and self-rated adherence for the past 30 days. The eigenvalue for this factor was 2.3, which explained 78% of item variance, and item factor loadings were .92, .88, and .85.

Cognitive and other personal factors were operationalized by depressive symptoms measured by the CES-D, and physical health, which was operationalized by the factor yielded by three scores: the 12-Item Short Form Health Survey (SF-12) physical functioning

scale, self-rated physical condition, and comorbid conditions. The eigenvalue for this factor was 1.6, which explained 53% of item variance, and item factor loadings were .83, .82, and .47.

Environmental influences were operationalized by a factor score created from saving the factor yielded by two measures: social capital and social support. The eigenvalue for this factor was 1.4, which explained 68% of item variance, and factor loadings were both .82.

Regression Analysis

The question addressed by the regression analyses was whether adherence self-efficacy had a direct effect on adherence to ART or whether its effect would be mediated by cognitive and other personal factors (depressive symptoms and physical health) and environmental factors (social capital and support). It may have been the case that increased adherence self-efficacy would be associated with lower depressive symptoms and better physical health and higher social capital and support and through those pathways predict increased adherence to ART. Conversely, adherence self-efficacy may have predicted increased adherence to ART controlling for its relationship with depressive symptoms, physical health, or social capital and support.

Mediation, or a diminution of the relationship between adherence self-efficacy and adherence to ART, would be demonstrated if the partial correlation between these two variables dropped substantially, or completely, when the three potential mediators were entered as a block of predictors prior to adherence self-efficacy entering the regression model.

As a single predictor, adherence self-efficacy yielded a moderately strong relationship with adherence to ART ($r = .48$, $p < .001$). As a set of predictors, the three potentially mediating variables yielding statistically significant associations with adherence ($R^2 = .09$, $df = 3$, 1,155, $p < .001$), with the partial correlation (pr) .09 for social support ($p = .002$), −.17 for depressive symptoms ($p < .001$), and −.07 for physical health ($p = .03$). In the second step of the model, adherence self-efficacy was added in Block 2 of the regression. Adherence self-efficacy largely retained its direct effect on adherence to ART, with a pr of .42 ($p < .001$); thus, the decrease in the strength of the association between adherence self-efficacy and adherence to ART with the potential mediators in the model was negligible. Additionally, two of the three mediators, physical health and social support, no longer retained significance. The pr for the depressive symptoms dropped from −.17 to −.10, but retained significance ($p < .001$). The model provided support for adherence self-efficacy as a robust predictor of ART adherence behavior, serving a partial mediating role between environmental influences and cognitive or personal factors (Table 3).

Discussion

Perceived self-efficacy is associated with chronic disease self-management, although the exact nature of the relationship remains elusive (Ritter et al., 2011). Most would agree that treating depressive symptoms and increasing social capital are beneficial. However, mental health treatment may not be accessible due to health insurance limitations or the reluctance of a client to engage in addressing long-standing psychological issues. The recent worldwide recession has decreased community stability and trust and worsened individual social capital, especially in highly marginalized populations. But access to effective ART treatment is widely available to persons living in the United States and Puerto Rico through publicly supported insurance programs such as Medicaid. Nurses and other healthcare providers can focus their interventions on promoting treatment self-efficacy through evidence-based interventions such as those that use informational motivation techniques while being

sensitive to the possible receptiveness of referrals for mental health and social services support, when patients are agreeable to engage these resources. Corless et al. (2012) found that the importance of regular and positive engagement with the healthcare provider could not be overstated in its contribution to both 3- and 30-day adherence with ART in an international sample.

That the environmental factors did not mediate the relationship between adherence self-efficacy and ART treatment adherence was surprising. Previous analyses have found that individual level social capital was associated with physiological and psychological health in an international sample of HIV-positive adults (Webel et al., 2012). Our data emphasize the centrality of self-efficacy in treatment adherence, and nurses can engage clients to improve those skills. While social determinants of health, such as social support and capital, may add challenges and complexity to the promotion of treatment adherence behavior of HIV-positive clients or patients, they should not be viewed as insurmountable barriers to improving this important health behavior. Rather, nurses can work with these clients or patients to improve internal factors, such as self-efficacy, to improve ART treatment adherence.

Limitations

All data were gathered through self-report. However, the large national sample size increases confidence in the validity of the findings.

Implications for Nursing Practice and Research

Interventions to improve treatment adherence have focused on a number of broad strategies (Hardy et al., 2011, McMahon et al., 2011; Parsons, Golub, Rosof, & Holder, 2007; Weiss et al., 2011); this evidence suggests that targeting treatment adherence alone may also improve ART adherence and reduce some cognitive and other personal barriers to adherence, irrespective of social capital and support. Client teaching has long been the domain of nursing practice, and this research provides evidence as to the value of ensuring that treatment self-efficacy is optimized. Simple interventions to improve treatment self-efficacy may not only impact ART adherence, but also some other, broader health-related outcomes such as health status and quality of life. ART medications reduce HIV viral load, which has a direct impact on promoting the immune status of the infected individual, but also a public health impact, since it decreases transmission of the virus from infected to uninfected persons.

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Clinical Resources

- Adherence to HIV Antiretroviral Therapy: http://hivinsite.ucsf.edu/InSite?page=kb-03-02-09
- Compendium of Evidence-Based HIV Behavioral Interventions: Medication Adherence Chapter: http://www.cdc.gov/hiv/topics/research/prs/ma-chapter.htm
- Adherence Guide for HIV/AIDS Clinical Care, HRSA HIV/AIDS Bureau June 2012: http://www.aidsed.org/aidsetc?page=cg-406adherence

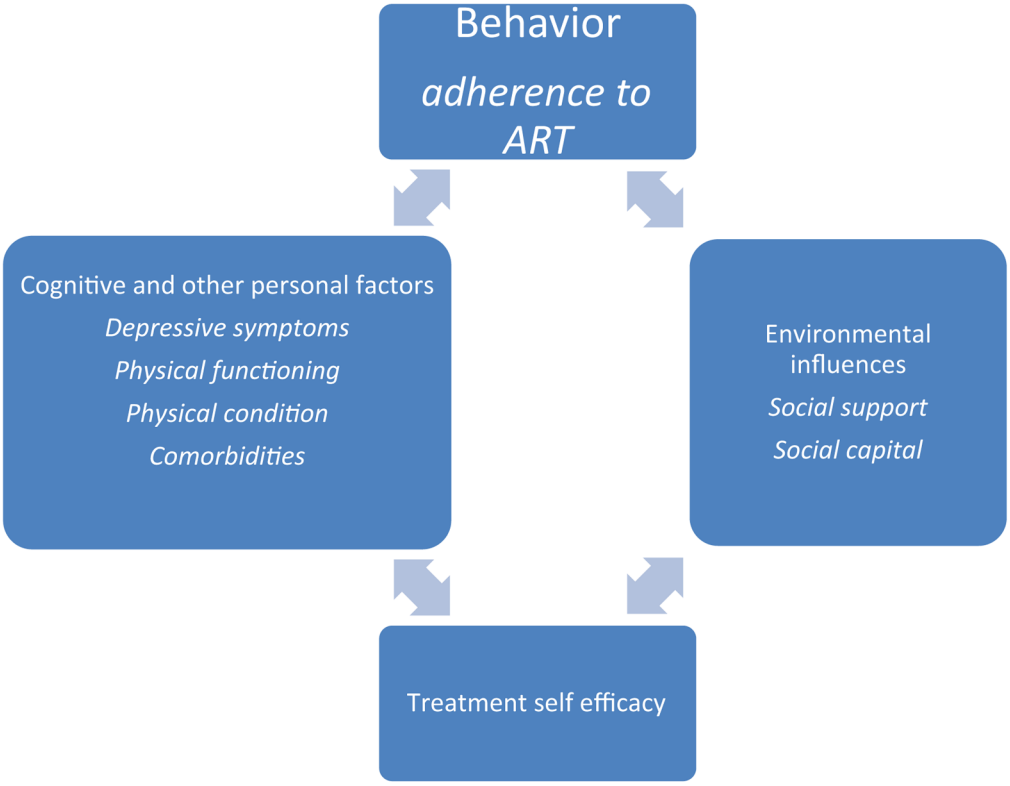

Figure 1.
Social cognitive triadic model.
Note. ART = antiretroviral therapy.

Table 1

Demographic and Human Immunodeficiency Virus (HIV) Information for Persons Taking HIV Antiretroviral Therapy (N = 1,414)[a]

	Frequency (%)	Mean (*SD*)
Age (yr); range: 18–74 yr		46.6 (8.9)
Gender		
Male	1,019 (71.1)	
Female	372 (26.3)	
Transgender	28 (2)	
Race Asian/Pacific Islander	61 (4.3)	
African American/Black	567 (39.5)	
Hispanic/Latino	348 (24.3)	
Native American	28 (20)	
White/Angelo	374 (26.1)	
Education level		
11th grade or less	350 (24.4)	
High school or GED	569 (39.7)	
2 yr college/AA	312 (21.8)	
4 yr college/BS/BA	148 (10.3)	
Master's degree or doctorate	45 (3.1)	
Self-reported income adequacy		
Totally inadequate	334 (23.3)	
Barely adequate	777 (54.2)	
Enough	302 (21.1)	
Do not work for pay	1140 (79.5)	
Has health insurance	1,128 (78.7)	
Self-reported HIV indicators		
Average year diagnosed with HIV/AIDS (range 1980–2011)	1996	
Diagnosed with AIDS	653 (45.5)	
Don't know viral load	323 (22.8)	
Don't know CD4 T cell count cubic millimeter of blood. A normal CD4 count in a healthy, HIV-negative adult can very but is usually between 600 and 1,200 CD4 Cells per mm^3	418 (29.6)	

[a]Percentages might not add up to 100% due to some missing data.

Note. GED = general equivalency diploma; AA = associate of arts degree; BS = bachelor of science degree; BA = bachelor of arts degree.

Table 2

Descriptive Statistics of the Instruments

Name	Mean (*SD*)	Range	Cronbach's α coefficients
Treatment adherence self-efficacy	95.99 (23.67)	12–120	0.94
Cognitive and other personal factors			
Center for Epidemiology Studies Depression Scale	20.95 (11.62)	0–57	0.86
Physical functioning – SF 12	43.08 (10.3)	10–67	0.81 (items 2a & 2b)
Physical condition	6.85 (2.11)	1–10	Single item
Comorbidity	0.68 (0.46)	0–1	Single item
Environmental influences			
Social Capital Scale	79.11 (16.92)	2–120	0.88
Social Support Scale	7.20 (2.61)	1–10	Single item
Behavior: Adherence with HIV treatment			
3-day Visual Analog Scale for Medication Adherence	90.05 (19.34)	0–100	Single item
30-day Visual Analog Scale for Medication Adherence	87.57 (19.35)	0–100	Single item
30-day adherence rating	3.99 (1.20)	0–5	Single item

Table 3

Regression Model Predicting Human Immunodeficiency Virus Medication Adherence Self-Efficacy

	R^2	Partial correlation
Block 1		
Variables entered		
Social support/capital	0.09 *	0.09 **
Physical health		0.07 ***
Depressive symptoms		0.17 *
Block 2		
Variables entered		
Social support/capital		ns
Physical health	0.25 *	ns
Depressive symptoms		0.10 *
Adherence self-efficacy		0.42 *

Note. ns = not significant.

* $p < .01$;

** $p = .02$;

*** $p = .03$.