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# Sexual Relationship Power and Depression among HIV-Infected Women in Rural Uganda

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## Abstract

**Background:** Depression is associated with increased HIV transmission risk, increased morbidity, and higher risk of HIV-related death among HIV-infected women. Low sexual relationship power also contributes to HIV risk, but there is limited understanding of how it relates to mental health among HIV-infected women.

**Methods:** Participants were 270 HIV-infected women from the Uganda AIDS Rural Treatment Outcomes study, a prospective cohort of individuals initiating antiretroviral therapy (ART) in Mbarara, Uganda. Our primary predictor was baseline sexual relationship power as measured by the Sexual Relationship Power Scale (SRPS). The primary outcome was depression severity, measured with the Hopkins Symptom Checklist (HSCL), and a secondary outcome was a functional scale for mental health status (MHS). Adjusted models controlled for socio-demographic factors, CD4 count, alcohol and tobacco use, baseline WHO stage 4 disease, social support, and duration of ART.

**Results:** The mean HSCL score was 1.34 and 23.7% of participants had HSCL scores consistent with probable depression (HSCL > 1.75). Compared to participants with low SRPS scores, individuals with both moderate (coefficient  $b = -0.21$ ; 95%CI,  $-0.36$  to  $-0.07$ ) and high power ( $b = -0.21$ ; 95%CI,  $-0.36$  to  $-0.06$ ) reported decreased depressive symptomatology. High SRPS scores halved the likelihood of women meeting criteria for probable depression (adjusted odds ratio = 0.44; 95%CI, 0.20 to 0.93). In lagged models, low SRPS predicted subsequent depression severity, but depression did not predict subsequent changes in SRPS. Results were similar for MHS, with lagged models showing SRPS predicts subsequent mental health, but not visa versa. Both Decision-Making Dominance and Relationship Control subscales of SRPS were associated with depression symptom severity.

**Conclusions:** HIV-infected women with high sexual relationship power had lower depression and higher mental health status than women with low power. Interventions to improve equity in decision-making and control within dyadic partnerships are critical to prevent HIV transmission and to optimize mental health of HIV-infected women.

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## Introduction

Depression is prevalent among HIV-infected populations throughout the world [1–5]. Among HIV-infected individuals in Uganda, 47% screened positive for probable depression [1], far exceeding population-based estimates of depression in the general population [2–5]. Multiple factors may contribute to high levels of depression among HIV-infected individuals, including concerns related to HIV-status disclosure [6], perceived HIV-related stigma [7–9], lack of social support [10], and the discomfort and fatigue of illness and physical decline [11–13]. Among HIV-infected persons,

symptoms of depression are associated with reduced quality of life [14,15], lower uptake of and adherence to antiretroviral treatment [16,17], immunologic decline [1,18–20], and AIDS-related mortality [12,20–23].

Depression is also particularly common among HIV-infected women, both in Uganda [10] and elsewhere globally [8,9,11,24–26]. Depression is associated with increased transmission risk behaviors among women in the general population, as well as elevated secondary transmission risk among HIV-infected women [2,27,28]. Similar to gendered risk of acquiring HIV, risk of depression once living with HIV/AIDS may be partially

attributable to gender inequalities in relationship power. This hypothesis is supported by several lines of evidence. First, low sexual relationship power is associated with experiences of intimate partner violence [29] which is itself a robust predictor of depression among women [30]. Second, analyses of data collected from samples of non-HIV-infected persons have linked powerlessness to depression among women experiencing intimate partner violence [27,31], and among young women [27,29]. Studies have found other negative health impacts of low sexual power among HIV-infected women, including malnutrition and worse HIV treatment outcomes [32,33].

While the presence or absence of intimate partner relationships [34,35] and other social ties [36] are well recognized as key contributors to mental health, less research has explored how power dynamics of intimate partnerships influence mental health [37,38]. Notably, little work has focused on elucidating how sexual relationship power influences mental health, particularly among HIV-infected women, one of the most vulnerable subgroups in resource-limited settings [39]. We therefore undertook a study to examine whether sexual relationship power is associated with symptoms of depression and mental health status among HIV-infected women in rural Uganda. We also assessed the extent to which the relationship control or decision-making dominance, subscales of the SPRS, were associated with depression.

## Methods

### Participants

The study took place in Uganda within the rural Mbarara District (population 427,000). The town of Mbarara (population 82,000) is located 275 kilometers southwest of Kampala. The main local language is Runyankole, and the majority of residents are ethnically Ankole. The Uganda AIDS Rural Treatment Outcomes (UARTO) prospective cohort study was initiated in July 2005. Participants were recruited from the Mbarara Regional Referral Hospital Immune Suppression Syndrome (ISS) Clinic, which dispenses free HIV antiretroviral therapy (ART) to HIV-infected persons in southwestern Uganda [40]. Participants were included if they were ART-naïve, older than 18 years of age, lived within 20 km of the ISS Clinic, and were initiating free ART. Beginning in August 2007, the study questionnaire was expanded with the addition of measures of sexual relationship power. Data for this paper were drawn from the first two quarterly study visits of all female participants who consented to the UARTO parent study.

### Data collection

Study interviews were conducted using standardized interviewer-administered instruments and blood draws to collect data on sexual relationship power, health behaviors, mental health and other socio-demographic and clinical variables. Surveys and written consent forms were translated into the native language of Runyankole, back translated into English, and pilot-tested to ensure accuracy. All instruments were administered in the field by a native Runyankole speaker. We used standard procedures for data entry and quality control.

### Ethics Statement

Written consent was obtained from all study participants. For participants who could not read or write, they were allowed to mark consent forms with an "X". Ethical approval for all study procedures was obtained from the University of California San Francisco Committee on Human Research, the Partners Human

Research Committee, and the Institutional Review Committee at Mbarara University of Science and Technology.

### Measurements

Our primary predictor, sexual relationship power, was measured at baseline using the sexual relationship power scale (SPRS) [41], a 22-item scale that has been previously used in research conducted in black African populations [42,43]. The SPRS was developed based on Connell's Theory of Gender and Power [44], which posits that gender imbalances within the household are partly responsible for men's disproportionate power over decision-making. The SPRS contains two subscales: Relationship Control and Decision-Making Dominance. The Relationship Control subscale is comprised of fourteen questions rated on a 4-point Likert-type scale designed to assess the extent to which women can exert sexual and emotional autonomy (e.g., "If I asked my partner to use a condom, he would get angry."). The Decision-Making Dominance subscale is comprised of eight questions designed to assess the balance of decision making power within the relationship (e.g., "Who usually has more say on whether you have sex?"). Responses are summed and normalized to a range of 1 to 4, with higher scores indicating greater relationship power. As suggested by Pulerwitz et al. [41], scale scores were split into tertiles representing 'low', 'medium' and 'high' power. Both subscales had excellent internal reliability (Relationship Control Cronbach's alpha = 0.95, Decision-Making Dominance alpha = 0.92), as did the SPRS scale as a whole (Cronbach's alpha = 0.96).

Our primary outcome was depression symptom severity, measured as a continuous variable in primary analyses using a modified version of the Hopkins Symptom Checklist for Depression (HSCL-D) [45–47]. For this analysis, we used HSCL-D measurements from two time points: at baseline (*t*) and 3 months after baseline (*t*+1). This fifteen-item measure has been widely used and validated in East African settings [10,48], and achieved a high degree of internal consistency in our sample (Cronbach's alpha = 0.86). Our secondary outcome was a measure of mental well being among HIV-infected persons, namely the Mental Health Summary (MHS) of the 35-item Medical Outcomes Study HIV Health Survey (MOS-HIV) [49–52]. The MHS is derived from multiple domains of functioning, including mental health, health distress, quality of life, cognitive function, vitality, and social function. Validation studies have been conducted in numerous settings [49–52], including East Africa [53].

### Statistical Analysis

We used multivariable linear regression to measure the associations between sexual relationship power and both (a) depression symptom severity (HSCL) and (b) mental health status (MHS). Depression was specified as a continuous variable, and estimates were adjusted for potential confounders, including age, CD4+ T-lymphocyte cell count, educational level, marital status, positive screen for hazardous drinking as measured by the AUDIT-C [54,55], tobacco use, history of a WHO stage 4 clinical condition, and length of time on ART. For ease of exposition we used logistic regression to estimate the association between probable depression (using the conventional threshold of 1.75 [56]) and sexual relationship power, while adjusting for the same covariates as specified above. To determine whether different aspects of relationship power were differentially associated with the outcomes of interest, we repeated the analyses using the relationship control and decision-making dominance sub-scales as covariates.

To assess the extent to which our estimates could be driven by reverse causality, we lagged covariates by three months. For this,

we used data from two time points. In the first lagged model, we estimated the association between SRPS at time  $t$  and depression at time  $t+1$ . In the second lagged model, we estimated the association between depression at time  $t$  and SRPS at time  $t+1$ . We repeated these analyses to assess directionality between SRPS and MHS.

## Results

Among the 325 eligible women, only the 270 participants (83.0%) who had complete information on all variables were included in this analysis (Table 1). There was no more than 6% missing data on any specific variable, with percent missingness less than 2% for most variables. There were no statistically significant differences between the 45 excluded individuals and the 270 included individuals in terms of any of our key predictors and outcomes of interest. The median age was 34 years (interquartile range [IQR] = 28–38 years). Approximately one-third of women were married at baseline, less than one-quarter had secondary education, and 34.8% of women were unemployed. Women lived a median of 45 minutes travel from the clinic, with some participants reporting travel times of up to 7 hours. Sixty-four (23.7%) women reported symptoms consistent with probable depression. The median MHS score was 46.7 (IQR, 38.5 to 53.3).

Sexual relationship power was associated with depression symptom severity in both unadjusted and adjusted models (Table 2). Specifically, in the models with contemporaneous covariates and outcomes, women with either moderate ( $b = -0.21$ ; 95% confidence interval [CI],  $-0.36$  to  $-0.07$ ) or high relationship power ( $b = -0.21$ ; 95% CI,  $-0.36$  to  $-0.06$ ) had lower depression symptom severity compared to women with low

relationship power. Other correlates of depression in adjusted analyses included being ART naive at baseline and travelling a greater distance to the clinic. When the outcome was specified as a binary variable indicating probable depression, women with moderate (adjusted odds ratio [AOR] = 0.46; 95% CI, 0.22–0.97) and high (AOR = 0.44; 95% CI, 0.20–0.93) relationship power were less likely to meet screening criteria for probable depression compared to women with low SRPS scores. In the lagged-covariate specification, SRPS at time  $t$  was associated with depression at time  $t+1$ .

Both moderate and high sexual relationship power were also associated with MHS (Table 3). In the models with contemporaneous covariates and outcomes, women with moderate relationship power had better mental health status ( $b = 3.38$ ; 95% CI, 0.08 to 6.68) compared to women with low relationship power. Women with high relationship power also had better mental health status ( $b = 3.03$ ; 95%,  $-0.32$  to 6.39), but the association was not statistically significant. Similar to the analysis of depression above, in the lagged-covariate specification, SRPS at time  $t$  was associated with MHS at time  $t+1$ .

Both subscales of the SRPS were associated with depressive symptoms. Women with both moderate ( $b = -0.31$ ; 95% CI,  $-0.45$  to  $-0.17$ ) and high Relationship Control ( $b = -0.19$ ; 95% CI,  $-0.33$  to  $-0.05$ ) had lower depression symptom severity compared to women with low relationship control. Similarly, women with moderate Decision-Making Dominance had lower depression symptom severity ( $b = -0.17$ ; 95% CI,  $-0.31$  to  $-0.03$ ). High decision-making dominance approached, but did not reach, statistical significance ( $p = 0.09$ ).

Finally, in order to assess the potential bi-directionality of the relationship between SRPS and the outcomes, we fit regression models with the outcomes specified as the primary exposure, and these were also lagged. Depression at time  $t$  was not predictive of SRPS at time  $t+1$  (Table 4). Similarly, MHS at time  $t$  was not predictive of SRPS at time  $t+1$ .

## Discussion

We found high levels of depression among rural Ugandan HIV-infected women, with more than one-quarter of participants meeting clinical criteria for probable depression, consistent with previous literature from the region [3,4]. The prevalence of depression in our sample (23.7%) was lower than in another Ugandan study (47%) in which participants were ART-naïve [1], consistent with considerable evidence that HAART may have psychological benefits for patients [57–59]. Women with higher sexual relationship power had reduced depression symptom severity, were less likely to meet criteria for probable depression, and had better mental health status compared to women with low relationship power. These associations were statistically significant and large in magnitude.

Our confidence in the directionality of the interpretation was strengthened by the lagged and reverse-lagged analyses, in which we showed that SRPS at time  $t$  was predictive of depressive symptoms (HSCL) at time  $t+1$  but that depression at time  $t$  was not predictive of SRPS at time  $t+1$ . The secondary outcome of MHS exhibited similar patterns in lagged and reverse-lagged models. These data suggest that sexual relationship power may be predictive of subsequent mental health among HIV-infected women.

Our findings are consistent with the Theory of Learned Helplessness [60], which posits that self-esteem, cognition, and motivation are shaped by beliefs of personal control and perceived power over life's outcomes [61,62]. Learned helplessness, in turn,

**Table 1.** Descriptive Statistics.

	All participants (N = 270)
Characteristics	Median (IQR)
<b>Sexual Relationship Power Scale (SRPS)</b>	2.46 (2.10 to 2.85)
<b>Sociodemographic Characteristics</b>	
Age	34 (28 to 38)
Married	104 (38.5%)
Household size	3 (1 to 5)
Secondary education	62 (23.0%)
Unemployed	94 (34.8%)
Asset Index	-0.17 (-1.40 to 1.44)
Distance to Clinic	0.75 (0.5 to 1)
<b>Clinical Characteristics</b>	
HSCL	1.34 (1.12 to 1.75)
Probable depression (HSCL > 1.75)	64 (23.7%)
Mental Health Status	46.7 (38.5 to 53.3)
ART naive at baseline	178 (54.8)
Heavy drinking (AUDIT-C)	18 (6.7%)
Tobacco Use (ever)	36 (13.3%)
WHO clinical stage IV at baseline	82 (30.4%)
Previously on ART	121 (44.8%)
CD4 count at baseline	207 (136 to 308)

IQR: Inter quartile range, HSCL: Hopkins Symptomatic Check List, ART: Antiretroviral Treatment; AUDIT-C: Alcohol Use Disorders Identification Test. doi:10.1371/journal.pone.0049821.t001

**Table 2.** Unadjusted and adjusted associations between depression severity and sexual relationship power (N = 273).

Characteristic	Depression severity (HSCL as continuous scale) Regression estimate <i>b</i> (95% confidence interval [CI])		
	Univariable	Multivariable (Contemporaneous)	Multivariable (Lagged)
<b>Sexual Relationship Power Scale (SRPS)</b>			
Low	Ref	Ref	Ref
Moderate	-0.32 (-0.47 to -0.17)***	-0.21 (-0.36 to -0.07)**	-0.12 (-0.22 to -0.01)*
High	-0.29 (-0.44 to -0.14)***	-0.21 (-0.36 to -0.06)**	-0.10 (-0.20 to 0.01)
<b>Socio-demographic Characteristics</b>			
Age	-0.01 (-0.05 to 0.03)	0.02 (-0.02 to 0.06)	0.02 (-0.01 to 0.05)
Married	-0.03 (-0.16 to 0.10)	0.04 (-0.08 to 0.17)	0.09 (0.00 to 0.18)
Household size	0.00 (-0.03 to 0.02)	-0.01 (-0.03 to 0.01)	-0.00 (-0.02 to 0.01)
Educated more than secondary school	-0.10 (-0.25 to 0.05)	-0.05 (-0.19 to 0.09)	-0.07 (-0.17 to 0.03)
Unemployed	-0.02 (-0.15 to 0.12)	-0.05 (-0.18 to 0.07)	-0.03 (-0.12 to 0.06)
Distance to Clinic	0.08 (0.01 to 0.15)*	0.09 (0.02 to 0.15)*	0.03 (-0.02 to 0.08)
<b>Clinical Characteristics</b>			
Heavy drinking (AUDIT-C)	0.30 (0.05 to 0.55)*	0.13 (-0.11 to 0.38)	0.16 (-0.02 to 0.34)
Tobacco Use	0.08 (-0.10 to 0.27)	0.02 (-0.16 to 0.19)	-0.04 (-0.16 to 0.09)
WHO Stage IV clinical condition	0.02 (-0.12 to 0.15)	0.05 (-0.07 to 0.18)	0.03 (-0.06 to 0.12)
CD4 count	-0.03 (-0.08 to 0.01)	0.02 (-0.02 to 0.07)	0.04 (0.01 to 0.07)*
Previously treated with ART	-0.39 (-0.51 to -0.27)***	-0.37 (-0.51 to -0.24)***	-0.19 (-0.29 to -0.09)***
Constant	-	1.66	1.2

\*P&lt;0.05;

\*\*P&lt;0.01;

\*\*\*p&lt;0.001.

HSCL: Hopkins Symptomatic Check List; AUDIT-C: Alcohol Use Disorders Identification Test; WHO: World Health Organization; ART: Antiretroviral Treatment.

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has long been associated with depression in clinical populations [63–65], and recent studies in animal models have begun to establish its pathophysiology [66–70]. Likewise, the Theory of Gender and Power [44], which postulates that unequal power dynamics (in economic, decision-making, and emotional realms) limit the ability of women to exercise personal control in relationships [71], provides a strong theoretical underpinning to the associations we observed in our data. This theory has been applied to a range of health outcomes, including HIV risk [42,72–75], and intimate partner violence [29], but has yet to be explored among HIV-infected women, and has rarely been applied to mental health [76,77]. This research suggests an important area for future research and intervention development among HIV-infected, female populations.

We attempted to determine whether different aspects of relationship power were differentially associated with depression but found that both SRPS subscales had statistically significant associations with the outcomes. Previous findings regarding SRPS subscales have been mixed, with many authors omitting Decision-Making Dominance due to low reliability, and others finding that only the Relationship Control sub-scale influenced health outcomes [42,78,79]. In-depth, qualitative research could further delineate the mechanisms through which sexual power may affect mental health.

Our study had several limitations. First, our measure of depression is based on a screening tool, and does not provide a conclusive diagnosis of major depressive disorder. Second, prospective longitudinal studies using longer follow-up times (beyond 3 months) and repeated measures are needed to confirm our findings. Third, our sample was limited to women who were initiating ART. Because individuals who are receiving ART have

already overcome significant barriers to engagement in care, our findings may not be generalizable to untreated populations.

Despite these limitations, our findings have implications for designing effective interventions for the mental health of HIV-positive women. The high burden of disease and dearth of evidence-based mental health interventions in low-resource settings [80] make intervention development a priority [81–83]. While HIV-infected women are at higher risk of depression than their male counterparts [27,84], according to a recent systematic review on this topic, few specific interventions have been developed for this population [85]. Our findings suggest that relationship power may be an important potential driver of depressive symptom severity among women living with HIV and AIDS, one of the most vulnerable and marginalized subgroups in low-resource settings [39]. Effective interventions to improve women's relationship power may have the added benefit of contributing to secondary prevention of HIV transmission, since low relationship power and gender-unequal norms have been linked to higher-risk sex [86,87], inconsistent condom use [88–90], and multiple partnerships [78]. Interventions to empower women in intimate dyadic relationships may have mental health benefits and should be assessed using randomized study designs.

In conclusion, we found that sexual relationship power in a sample of women living with HIV in rural Uganda is strongly associated with symptoms of depression and worse mental health status. The overlapping epidemics of HIV/AIDS and depression require integrated programs that target the intimate relationships shaping women's overall health and well being.

**Table 3.** Unadjusted and adjusted associations between mental health and sexual relationship power (N = 273).

Characteristic	Mental Health Status (MHS as continuous scale) Regression estimate <i>b</i> (95% confidence interval [CI])		
	Univariable	Multivariable (Contemporaneous)	Multivariable (Lagged)
<b>Sexual Relationship Power Scale (SRPS)</b>			
Low	Ref	Ref	Ref
Moderate	6.40 (2.91 to 9.90)***	3.38 (0.08 to 6.68)*	3.47 (0.72 to 6.23)*
High	5.55 (2.03 to 9.06)**	3.13 (−0.21 to 6.46)	2.81 (0.13 to 5.49)*
<b>Socio-demographic Characteristics</b>			
Age	0.81 (−0.10 to 1.73)	−0.03 (−0.91 to 0.85)	−0.50 (−1.23 to 0.24)
Married	−2.00 (−5.02 to 1.01)	−3.23 (−6.10 to −0.36)*	−1.72 (−4.07 to 0.63)
Household size	0.03 (−0.53 to 0.58)	0.10 (−0.42 to 0.62)	0.25 (−0.19 to 0.67)
Educated more than secondary school	0.78 (−2.72 to 4.28)	0.27 (−3.41 to 2.86)	−0.50 (−3.07 to 2.06)
Unemployed	−1.92 (−5.01 to 1.16)	−0.30 (−3.13 to 2.54)	1.14 (−1.21 to 3.49)
Distance to Clinic	−1.37 (−3.05 to −0.30)	−1.85 (−3.35 to −0.35)*	−0.75 (−1.96 to 0.46)
<b>Clinical Characteristics</b>			
Heavy drinking (AUDIT-C)	−48.55 (−14.33 to −2.69)**	−4.15 (−9.57 to 1.26)	−3.82 (−8.25 to 0.61)
Tobacco Use	−0.66 (−4.99 to 3.67)	0.07 (−3.87 to 4.01)	1.60 (−1.67 to 4.86)
WHO Stage IV clinical condition	−0.48 (−3.68 to 2.72)	−1.85 (−4.73 to 1.02)	0.19 (−2.14 to 2.51)
CD4 count	1.69 (0.72 to 2.65)**	0.00 (−0.01 to 0.01)	0.00 (−0.01 to 0.01)
Previously treated with ART	11.25 (8.61 to 13.89)***	10.02 (7.02 to 13.02)***	3.44 (1.00 to 5.89)**
Constant	−	41.12	48.87

\**p* < 0.05;\*\**p* < 0.01;\*\*\**p* < 0.001.

MHS: Mental Health Status; AUDIT-C: Alcohol Use Disorders Identification Test; WHO: World Health Organization; ART: Antiretroviral Treatment.

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**Table 4.** Adjusted reverse-lagged associations between SRPS and subsequent mental health.

Characteristic	Depression severity (HSCL as continuous scale)	Mental Health Status (MHS as continuous scale)
	Regression estimate <i>b</i> (95% confidence interval [CI])	
Sexual Relationship Power Scale (SRPS)	−0.11 (−0.27 to 0.04)	0.00 (−0.00 to 0.01)
<b>Socio-demographic Characteristics</b>		
Age	−0.01 (−0.05 to −0.07)	0.01 (−0.06 to 0.07)
Married	0.22 (0.06 to .038)**	0.23 (0.07 to 0.39)**
Household size	0.01 (−0.02 to 0.04)	0.01 (−0.02 to 0.04)
Educated more than secondary school	0.11 (−0.06 to 0.28)	0.12 (−0.06 to 0.29)
Unemployed	−0.14 (−0.31 to 0.02)	−0.14 (−0.30 to 0.02)
Distance to Clinic	0.07 (−0.02 to 0.17)	0.07 (−0.03 to 0.17)
<b>Clinical Characteristics</b>		
Heavy drinking (AUDIT-C)	0.18 (−0.14 to 0.50)	0.19 (−0.13 to 0.52)
Tobacco Use	0.20 (−0.05 to 0.44)	0.20 (−0.05 to 0.44)
WHO Stage IV clinical condition	−0.08 (−0.25 to 0.09)	−0.08 (−0.25 to 0.08)
CD4 count	−0.01 (−0.07 to 0.04)	−0.02 (−0.08 to 0.39)
Previously treated with ART	0.05 (−0.13 to 0.23)	−0.07 (−0.12 to .025)
Constant	2.47	2.18

\**p* < 0.05,\*\**p* < 0.01,\*\*\**p* < 0.001.

HSCL: Hopkins Symptomatic Check List; MHS: Mental Health Status; AUDIT-C: Alcohol Use Disorders Identification Test; WHO: World Health Organization; ART: Antiretroviral Treatment.

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## Author Contributions

Conceived and designed the experiments: ACT EK PWH JNM DRB SDW. Performed the experiments: ACT EK PWH JNM DRB SDW. Analyzed the data: AMH ACT SLD PWH GC SDW. Wrote the paper: AMH ACT EK SLD PWH JNM GC DRB SDW.

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