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Social support, physical activity and psychological distress among community-dwelling older Ghanaians

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ABSTRACT

Objective: Physical activity (PA) has often been linked with improved mental health outcomes among older people but the subject has received limited attention in sub-Saharan African context. This paper examines the moderating effect of social support (SS) on the association between PA and psychological distress (PD) among community-dwelling older persons in Ghana.

Methods: Individuals 50 years or older ($N = 1200$) who participated in a 2016/2017 Aging, Health, Psychological Wellbeing and Health-seeking Behavior Study (AHPWHB) were included. PD outcome, measured by the Kessler Psychological Distress Scale (KPDS-K10) was regressed on PA levels, SS and the interaction term.

Results: Findings suggest that regular PA (OR = 0.824; 95%CI: 0.610–0.913) and higher levels of SS (OR = 0.475; 95%CI: 0.360–0.626) were associated with reduced PD outcomes after adjusting for theoretically relevant confounding variables. More importantly, the inclusion of the interaction term (PA × SS) showed a significant negative relationship of regular PA with the PD outcome as SS levels increased (OR = 0.651; 95%CI: 0.376–0.727).

Conclusions: Although regular PA potentially contributes to reducing PD among older persons, the relationship is even stronger for those embedded in a higher constellation of SS. Policy and practical interventions seeking to improve regular PA engagement such as old-age friendly environment and psychological resources for socially isolated older persons are warranted.

1. Introduction

Whilst demographic aging has become a global phenomenon in recent decades, Ghana is among the fastest aging countries in sub-Saharan Africa with 7.0% of the population aged ≥60 years in 2015 (United Nations, 2017). By the year 2050, the total Ghanaian population is projected to increase by approximately 4.1%, but those aged 50+ years are expected to grow by 6.3%, compared to 2015 estimates (Biritwum, Mensah, Yawson, & Minicuci, 2013). The rising life expectancy of older people in resource poor settings often goes along with many socioeconomic and health-related challenges, including increases in old-age poverty (partly due to retirement and irregular income sources), declines in physical functioning, increased psychological distress (PD) and general later-life poor health outcomes (Gyasi & Phillips, 2018; WHO, 2015). The capacity to cope with these life-time events and to maintain independence in old age is highly linked with mental functional status, adaptive behaviors such as physical activity (PA) as well the availability of psychological coping resources such as social support (SS) (Gyasi, Phillips, & Abass, 2018; United Nations, 2017). Regular and effective PA not only essential for psychological wellbeing but also key components of successful aging (Ferri, James, & Pruchno, 2009; Kleineidam et al., 2018; Rowe & Kahn, 1987) and active aging agendas (Foster & Walker, 2015).

Achieving desired functional abilities requires certain levels of moderate-to-vigorous PA (Fellendorf et al., 2017; Kim, 2013; Lee et al., 2012; Menec, 2003; Wen et al., 2011) as well as strong SS (Gyasi, Phillips, Abass, 2018). Although social grouping *per se* can be a source of stress and may, in turn, contribute to poorer psychological state (Litwin, 2012), available evidence indicates that higher degree of social integration is associated with lower risk of physiological dysregulation in a dose-response manner in middle and older ages (Stoeckel & Litwin, 2016; Yang et al., 2016). Conversely, physical inactivity may possibly increase the risk of inflammation by similar magnitude as social isolation in later life. Moreover, lack of intergenerational support and sedentary lifestyle and inactivity have been shown to be a major risk factor for poor mental health including PD and dementia as well as

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disability and mortality especially among often vulnerable older persons (Crooks, Lubben, Petitti, Little, & Chiu, 2008; Rodriguez et al., 2018). Indeed, various levels of social relationships and participation in leisure PA and engagement in regular PA interventions among older persons may potentially buffer and delay or counter probable functional decline, helping those affected to maintain the highest degree of quality of life. In addition, strong SS and PA allow older adults to remain active, productive, socially connected, and engaged in the community (Kim, 2013), and also are consistently related to wide-ranging psychological wellbeing indicators (Gyasi, Phillips, Abass, 2018).

Whereas evidence is almost missing in sub-Saharan country context, studies examining the *interactive* impacts of both SS and regular PA on PD are generally much limited. Yet, a clear understanding of the unique pathways through which regular PA contributes to psychological wellbeing in the company of SS remains a key component of health and healthy aging policy frameworks. Consequently, the purpose of the current study is to investigate the complex association between PA and SS in relation to PD using data from a 2016/2017 Aging, Health, Psychological Wellbeing and Health-seeking Behavior Study (AHPWHB). Specifically, the study examines the respective effects of regular PA, SS, and their interaction on PD outcomes among community-dwelling older persons in Ghana.

This knowledge base is important to develop new management and health promotion strategies to reduce later life PD in Ghana as the study may increase understanding of the complexities of personal resources and behaviors that in turn may promote successful aging. It is hypothesized, therefore, that an increase in PA would be associated with a decrease in PD. This is related to the evidence that PA, like a number of other safe and inexpensive lifestyle interventions, holds the promise of better mental health outcomes for older adults (Lautenschlager, Almeida, Flicker, & Janca, 2004; Yang et al., 2016). It is further hypothesized that the negative relationship between PA and PD would be more pronounced or moderated by increasing SS. This might be explained by the view that greater social interaction may directly reduce PD (Gyasi, Phillips, Abass, 2018) and also encourage people to remain physically active (Musick & Wilson, 2008) through the buffering effects and coping resources of making regular contacts and increase problem-solving mechanisms (Cohen & McKay, 1984; Stoeckel & Litwin, 2016).

2. Data and methods

2.1. Sample

The study drew on cross-sectional survey data from an Aging, Health, Psychological Wellbeing and Health-seeking Behavior (AHPWHB) project conducted between July 2016 and February 2017. This was a large-scale representative survey based on a multistage stratified area probability sampling with an oversample of Ghanaian adults aged 50 years and older. The one-on-one, face-to-face interview lasting about 65 min provided detailed information on social support, physical and mental health outcomes, health behaviors as well as health-seeking behavior issues among community-dwelling older persons in Ashanti Region of Ghana through an interviewer-administered questionnaire. The survey questionnaire was developed in English and translated into Twi (the major local dialect) following WHO translation guidelines for assessment of instruments (Üstun, Chatterji, Mechbal, Murray, & WHS Collaborating Groups, 2005). Sampling details of AHPWHB have been reported elsewhere (Gyasi & Phillips, 2018; Gyasi, 2018; Gyasi, Phillips, Abass, 2018; Gyasi, Phillips, & Buor, 2018).

Briefly, three sub-regional zones were demarcated from the study area based on the geographical and socio-cultural diversities (Ghana Statistical Service, 2012). The sub-regions were then stratified by rural and urban areas in randomly selected six districts. Despite a minimum sample of 901 based on sample size estimation (Lwanga & Lemeshow, 1991), the final sample included 1200 eligible respondents as a result of adjustments for potential nonresponses. The analytic sample represented 6.32% and 0.073% of the total older population in the study region and Ghana respectively.

2.2. Ethics

In line with the Declaration of Helsinki (Carlson, Boyd, & Webb, 2004), Human Subject Certification was received prior to the interview. Study protocol was approved by the Committee on Human Research Publication and Ethics, School of Medical Sciences, Kwame Nkrumah University of Science and Technology and Komfo Anokye Teaching Hospital, Kumasi, Ghana (Ref: CHRPE/AP/507/16). Ethics approval was also granted by the Research Ethics Committee of Lingnan University, Hong Kong. Study participants were fully briefed on the research. Participation was voluntary and participants were assured of the confidentiality of information. An informed written or verbal consents were obtained from all respondents. They were requested to sign or thumbprint a written informed consent form. Those who were uncomfortable signing or thumb printing the written consent form were given the option to provide verbal consent.

2.3. Measures

2.3.1. Psychological distress (PD)

The study used the Kessler Psychological Distress Scale (KPDS-K10), a 10-item screening tool to identify individuals' level of PD (Kessler et al., 2002). The KPDS-K10 scale evaluates how respondents felt during the previous 30 days on a 5-point Likert scale: 1 = "none of the time", 2 = "a little of the time", 3 = "some of the time", 4 = "most of the time", and 5 = "all of the time. Respondents were asked, "*In the last 30 days about how often did you feel…* (1) "tired out for no good reason?", (2) "nervous or uneasy?", (3) "so nervous that nothing could calm you down?", (4) "hopeless or lonely?", (5) "restless or fidget?", (6) "so restless you could not sit still?", (7) "depressed?", (8) "that everything was an effort?" (9) "so sad or bored that nothing could cheer you up?" and (10) "worthless" or "having no value?" Internal consistency was $\alpha = 0.88$. The overall score was 10–50. According to Andrews and Slade (2001), a score < 20 indicates psychologically well, 20–24 reflects experiencing mild distress, 25–29 shows moderate distress and ≥ 30 indicates severe PD. In this analysis, I used a cut-off point of ≥ 20 to define PD, according to a previous validation study by Victorian Population Health Survey (2001). Herrman et al. (2002) explains that the dichotomized PD variable in community-based studies is an effective way to identify people who may need further clinical evaluations for diagnosis.

2.3.2. Physical activity (PA)

PA was measured with an item adapted from the General Physical Activity Questionnaire (GPAQ) (Department of Health & Social Care, 2013): "How many days in the last week did you walk for at least 30 min in total; do moderate activities such as dancing for about 30 min in total; do vigorous activities such as running, sporting, gardening, heavy housework"? The responses were recorded on a ratio scale ranging 0–7.

2.3.3. Social support (SS)

Two important aspects of informal SS variables: frequencies of contact with family or close friends and social participation were used to assess SS. First, the questionnaire considered the frequency of contact with close family members and friends over the past month. Second, the frequency of participation in social events involved four activities: attendance at religious services, a social clubs/organization meetings, sports/cultural activities and civic/political organizations. The responses for these stream of questions were provided on a five-point scale: 0 = 'never', 1 = 'less frequently', 2 = 'frequently', 3 = 'very frequently', and 4 = 'every day'. The overall score was 0–40.

2.4. Covariates

Sociodemographic attributes and health-related variables that have been reported in previous studies to be associated with mental health (see e.g. Litwin, 2012; Back & Lee, 2011; Zivin et al., 2010) were included as controls in the current analysis. Whilst age in years was entered as continuous variable, gender (males = 0; females = 1), marital status (married or partnered = 0; not married or not partnered = 1) and health insurance (non-enrolled = 0; enrolled = 1) were dichotomous variables. Education was classified into three levels, using the International Standard Classification of Education (ISCED-1997) including: primary education or less = 0; high/secondary school education = 1; tertiary/post-secondary education = 2. Rural/urban residence and ethnic differences reflected in the inclusion of various study districts (Kumasi = 0; Ejura-Sekyedumase = 1; Sekyere Central = 2; Bosomtwe = 3; Amansie Central = 4; Adansi North = 5). As regards the health-related control factors, we included self-rated health (SRH) (4-point Likert scale: excellent/very good = 0; good = 1; fair = 2; poor = 3). Number of chronic diseases (comorbidities) was assessed through self-reports of diagnosis of ten chronic illnesses by a healthcare professional with no = 0; yes = 1 response scale in each case. These illnesses included diabetes, respiratory diseases, cancers, stroke, chronic kidney diseases, asthma, arthritis, depression and insomnia. The total score ranged from 0 to 5 with higher score indicating higher comorbidity level. Activities in daily living (ADLs) and functional decline was based on difficulty in carrying out nine daily tasks including eating, dressing/undressing, grooming, getting in/out of bed, bathing, moving tables/chairs, washing, lifting/carrying groceries and walking more than a kilometer during the previous 30 days. Responses were recorded on a 4-point scale: not limited at all = 0; less limited = 1, somewhat limited = 2; much limited = 3. The total score ranged 0–27 with a higher score indicating higher level of ADLs decline (WHO, 2012).

2.5. Analytic strategy

The analysis was presented in three stages. Univariate analysis was conducted to describe the study sample. In the bivariate analysis, we performed unadjusted associations and correlations between the PD outcome variable and the background and health-related factors. Finally, several generalized multivariate logistic regression models were used in which the PD level was regressed on the major independent variables, SS and PA, controlling for the potential confounders. Model 1 regressed PD outcome on PA only whilst Model 2 considered SS only. These models repeated the initial bivariate (unadjusted) regression analysis to estimate the variance explained by the two key independent variables, PA and SS. In addition, PD was regressed on both PA and SS simultaneously in Model 3. Model 4 added the socioeconomic and health-related factors as control variables. Finally, the full model (Model 5) included the interaction term (PA × SS) of respondents. A p value less than 0.05 was considered statistically significant and all analyses were performed using SPSS v.21.0 (IBM, Armonk, NY).

3. Results

3.1. Sample characteristics

Table 1 presents the distributions of the study variables. The sample had a majority of women (63%) and an average age of approximately 66 years (SD = 11.85; range = 50–111). Slightly more than a half were not married whilst the majority (38%) resided in Kumasi Metropolis (the main urban district of Ashanti Region). A bit less than one-sixth (14%) had secondary education or higher, while a whooping majority (86%) either had completed primary education or never. About 70% of the respondents reported being enrolled on the National Health Insurance Scheme. Regarding health-related issues, respondents reported having been diagnosed of two chronic conditions on average (SD = 0.79) and the mean number of ADL limitations was higher (mean = 14; SD = 5.09). Participants self-rated their own health as excellent/very good (20%), good (31%), fair (29%) and poor (20%). In terms of PD status, about 45% were depressed. The mean of SS size and PA were 6 (SD = 2.68) and 9 (SD = 4.43) respectively.

Table 1
Univariate analysis of selected outcome and explanatory variables among older persons.

Variables	Valid N	(%)	Mean	(SD)	Range
Background characteristics					
Age			66.15	(11.85)	50-111
Sex					
Female	759	(63.3)			
Male	441	(36.8)			
Marital status					
Married or partnered	521	(43.4)			
Not married or not partnered	679	(56.6)			
District					
Kumasi metropolis	460	(38.3)			
Ejura-Sekyedumase	140	(11.7)			
Sekyere Central	110	(9.2)			
Bosomtwe	150	(12.5)			
Amansie Central	150	(12.5)			
Adansi North	190	(15.8)			
Educational level					
None or Primary	1034	(86.2)			
Secondary	104	(8.7)			
Tertiary	62	(5.2)			
Health insurance					
Non-enrolled	332	(30.0)			
Enrolled	775	(70.0)			
Health-related characteristics					
#Chronic diseases			1.67	(0.79)	0-5
ADLs decline			13.70	(5.09)	0-27
SRH					
Very good/excellent	239	(19.9)			
Good	369	(30.8)			
Fair	348	(29.0)			
Poor	244	(20.3)			
PD					
Not distressed	656	(54.7)			
Distressed	544	(45.3)			
PA			8.75	(4.43)	0-7
SS			6.10	(2.68)	0-40

PA = Physical Activity; SS = Social Support; PD = psychological distress; ADLs = activities in daily living; SRH = self-rated health.

3.2. Bivariate associations

Unadjusted bivariate relationships between PD and independent variables are presented in Table 2. Findings show that regular PA and SS were both negatively associated with the PD outcome measure. Moreover, apart from age and educational status, all other covariates showed significant associations with PD. Whilst negative association was found for health insurance, being female, not married, residing in a district other than Kumasi and reporting suboptimal health status were positively related with PD. Moreover, bivariate correlation matrix is shown in Table 3. Strong negative correlations between PD and PA and SS were found. Also, all the control variables except for age, gender and education level showed significant correlations with PD. Whilst positive associations were observed for being unmarried, living in rural districts and all the health-risk factors, health insurance enrolment was negatively related with PD. PA was related to all the study variables except for district and educational level. Finally, SS also correlated with only marital status, health insurance and SRH.

Table 2
Unadjusted associations of dependent and independent variables.

Variables	Bivariate logit regression estimates	
	OR	(95%CI)
PA	0.531	(0.422–0.668)***
SS	0.496	(0.392–0.628)***
Age	1.003	(0.993–1.013)
Sex (ref: males)	1.644	(1.294–2.088)***
Marital status(ref: married)	2.221	(1.755–2.811)***
District (ref: Kumasi)	1	
Ejura-Sekyedumase	1.690	(1.154–2.475)**
Sekyere Central	1.515	(1.196–2.305)*
Bosomtwe	1.736	(1.197–2.517)**
Amansie Central	1.328	(0.914–1.930)
Adansi North	2.274	(1.612–3.208)***
Education (ref: primary or none)	1	
Secondary	0.930	(0.620–1.395)
Tertiary	0.645	(0.378–1.100)
Health insurance (ref: enrolled)	0.759	(0.586–0.982)*
#Chronic diseases	1.399	(1.208–1.620)***
ADLs decline	2.226	(1.731–2.862)***
SRH (ref: very good)	1	
Good	0.911	(0.647–1.284)
Fair	1.803	(1.285–2.530)***
Poor	3.927	(2.691–5.731)***

OR = Odds Ratio; CI = Confidence Interval; PA = Physical Activity; SS = Social Support; ADLs = activities in daily living; SRH = self-rated health.
*** $p < 0.001$.
** $p < 0.005$.
* $p < 0.05$.

3.3. Main regression models

Table 4 presents the analysis of the generalized logistic regression. Models 1 and 2 repeated the bivariate analysis but the interest was to determine the variance explained by the key independent variables. The results found that 4.2% and 4.8% of the variance were explained by PA and SS respectively. In Model 3, the PD outcome was simultaneously regressed on PA and SS. Whereas the effect sizes of PA (OR = 0.551; 95%CI: 0.436–0.696) and SS (OR = 0.514; 95%CI: 0.405–0.652) largely remained the same, the model explained variance increased to 7.5%. In Model 4, the entry of the control variables modified the previously observed associations and further increased the amount of explained variance considerably to 42.2%. In this model, both PA and SS retained their significant inverse relationships with PD. Whilst the effect size of PA dropped dramatically (OR = 0.824; 95%CI: 0.610–0.913), that of SS increased slightly (OR = 0.475; 95%CI: 0.360–0.626). With the addition of the interaction term (PA × SS) in Model 5, the main effects of both PA and SS maintained their statistical robustness and negative associations with PD. More importantly, the interaction effect revealed a significant negative relationship with PD (OR = 0.651; 95%CI: 0.376–0.727). The moderating effect of SS in the PA-PD relationship is shown in Fig. 1, indicating that increases in SS strengthens the negative association between PA and PD. However, the inclusion of the interaction term into the analytic model increased the explained variance in the outcome measure by 0.8% only and also did not change the associations between the control variables and PD (Table 4).

4. Discussion

The primary objective of this representative study of community-dwelling older Ghanaian was to examine whether regular PA is independently related to psychological health status and most importantly to interrogate the specific effect of SS in this relationship. The main findings were that older adults who engaged in regular PA were less likely to be psychologically distressed. In fact, PA in old age is strongly related to ensuing mental functioning ability. Furthermore, the negative relationship between PA and PD was significantly moderated by SS and even fortified the association with an increase in size of SS. These findings underscore the instrumental and dual roles of SS in later life in countering mental health problems independently and also in concert with PA.

This study contributes to the literature in a number of ways. The initial hypothesis that regular PA would be negatively associated with PD was validated by this analysis in that PA significantly and inversely related to the PD outcome even after adjusting for the SS and the sociodemographic characteristics as well as health-related confounders. This finding is consistent with some Western country studies which noted positive correlations between vigorous PA and improved mental health status (Black et al., 2015; Litwin, 2012; McAuley & Rudolph, 1995; Wassink-Vossen et al., 2014). Specifically, previous studies have linked PA with mental health outcomes, such as cognition, depressive symptomology, and dementias among older people (Parker et al., 2016; Penedo & Dahn, 2005; Stathi, Fox, & McKenna, 2002). Taaffe et al. (2008) noted that physically active people tend to function better than those who are inactive and they generally have a better mental conditions. It is, therefore, conceivable that aside from biological explanations, regular engagement in PA may redirect deep personal thoughts to environmental circumstances potent enough to holistically stabilize cognitive system.

Findings demonstrated that the negative association between SS and

Table 3
Correlation matrix for study variables: Pearson coefficients.

	PD	PA	SS	Age	Gender	Marital status	District	Educational level	Health insurance	#Chronic diseases	ADLs decline
PD	–										
PA	−0.156***	–									
SS	−0.170***	0.081**	–								
Age	0.017	−0.309***	−0.019	–							
Gender	−0.118	0.164***	−0.010	−0.003	–						
Marital status	0.193***	−0.255***	−0.098***	0.219***	−0.389***	–					
District	0.123***	0.031	−0.017	0.022	0.056	0.063*	–				
Educational level	−0.044	0.023	0.039	−0.095***	0.219***	−0.196***	0.013	–			
Health insurance	−0.063*	−0.098***	0.065*	0.182***	−0.008	0.005	−0.042	0.081**	–		
#Chronic diseases	0.131***	−0.218***	0.035	0.178***	−0.109***	0.103***	−0.060*	−0.016	0.189***	–	
ADLs decline	0.182***	−0.399***	−0.041	0.338***	−0.121***	0.195***	−0.055	−0.060*	0.089**	0.359***	–
SRH	0.243***	−0.309***	−0.081**	0.234***	−0.169***	0.177***	−0.038	−0.108**	−0.003	0.251***	0.390***

PA = Physical Activity; SS = Social Support; PD = psychological distress, ADLs = activities in daily living; SRH = self-rated health.
*** $p < 0.001$.
** $p < 0.005$.
* $p < 0.05$.

Table 4
Multivariate analyses of the association of PD and SS in relation to PD among older adults: Generalized logit regression.

Variables	MODEL 1		MODEL 2		MODEL 3		MODEL 4		MODEL 5	
	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)
PA	0.531	(0.422–0.668)***			0.551	(0.436–0.696)***	0.824	(0.610–0.913)**	0.875	(0.383–0.864)**
SS			0.496	(0.392–0.628)***	0.514	(0.405–0.652)***	0.475	(0.360–0.626)***	0.469	(0.428–0.872)**
PA × SS									0.651	(0.376–0.727)**
Age							0.984	(0.971–0.996)*	0.982	(0.969–0.995)**
Sex (ref: males)							1.289	(0.944–1.761)	1.247	(0.907–1.714)
Marital status(ref: married)							1.570	(1.162–2.121)**	1.512	(1.113–2.056)**
District (ref: Kumasi)										
Ejura-Sekyedumase							1.160	(0.750–1.795)	1.118	(0.715–1.748)
Sekyere Central							1.153	(0.699–1.903)	1.184	(0.713–1.966)
Bosomtwe							1.681	(1.108–2.551)*	1.798	(1.177–2.747)**
Amansie Central							1.107	(0.716–1.711)	1.010	(0.649–1.574)
Adansi North							2.813	(1.868–4.235)***	2.980	(1.956–4.541)***
Education (ref: primary or none)										
Secondary							1.174	(0.717–1.923)	1.158	(0.701–1.914)
Tertiary							1.196	(0.650–2.199)	1.412	(0.759–2.627)
Health insurance							0.736	(0.546–0.992)*	0.726	(0.536–0.984)*
#Chronic diseases							1.287	(1.073–1.544)**	1.273	(1.055–1.534)*
ADLs decline							1.397	(1.296–2.961)*	1.572	(1.109–2.228)*
SRH (ref: very good)										
Good							0.805	(0.540–1.200)	0.786	(0.524–1.177)
Fair							1.653	(1.105–2.474)*	1.595	(1.059–2.401)*
Poor							3.106	(1.964–4.911)***	2.960	(1.854–4.725)***
2 Log likelihood	−1623.603		−1618.518		−1593.189		−1322.271		−1287.256	
Nagelkerke Pseudo-R^2	0.042		0.048		0.075		0.422		0.430	
Observation	1200		1200		1200		1,107		1,085	

OR = Odds Ratio; CI = Confidence Interval; PA = Physical Activity; SS = Social Support; PD = psychological distress; ADLs = activities in daily living; SRH = self-rated health.

*** $p < 0.001$.

** $p < 0.005$.

* $p < 0.05$.

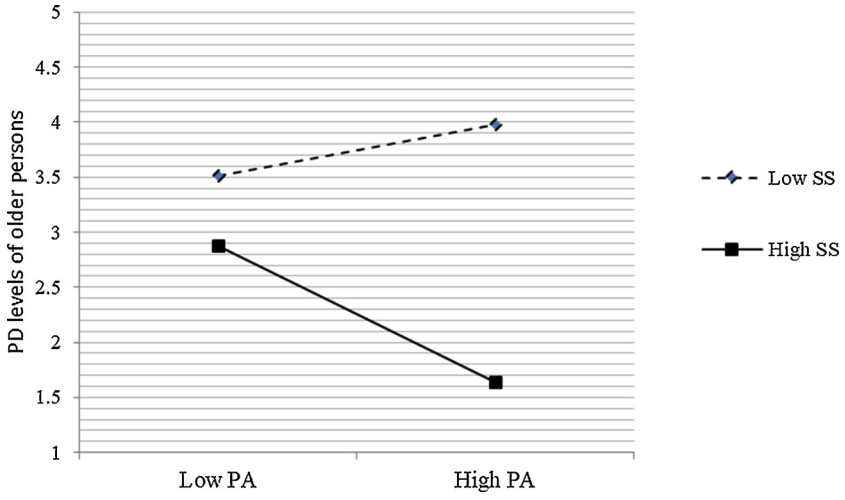

Fig. 1. The moderating effect of PA and SS in relation to PD.

PD also remained robust in the midst of PA and the control variables. The indication is that social connectedness and integration of older people into relevant others appeared meaningful and independently contributed to better psychological health. Strong SS appears to be good predictor of psychopathology outcomes including improved mental health (Gyasi, Phillips, Abass, 2018) or reduced risks of cognitive impairment (Musick & Wilson, 2008) and better health-related quality of life (Hajek, Brettschneider, & Lange, 2015).

The results found significant interactions between PA and SS in the context of PD outcome measure suggesting that SS fortifies the negative relationship between PA and PD. The hypothesis relating to the moderation of the association between PA and PD by increasing SS was, therefore, fully supported. This observation could be explained by the fact that older persons who are embedded in larger, stronger and supportive social networks are likely to maintain better physical health and may have the opportunity to engage in more frequent vigorous PA. They therefore tend to live heathier and longer lives with less evidence of PD compared with those who are socially isolated (Holt-Lunstad, Smith, & Layton, 2010). Greater social interaction may be a panacea and also encourage older people to remain physically active (Musick & Wilson, 2008) through the buffering effects and coping mechanisms of making regular contacts and increase problem-solving strategies (Cohen & McKay, 1984; Stoeckel & Litwin, 2016). Moreover, meaningful interpersonal relations may directly reduce psychological stress levels and in turn provide psychological implications such as enhancement of endocrine and immune functioning (Yang et al., 2016).

The interpersonal and socially congenial environment in which older people are embedded not only affect their mental health independently but also moderate or temper with the contribution of regular PA to improve effective psychological functioning.

5. Strengths and limitations

This study provides several contributions to the research literature and policy engagements. This study has extended behavioral, psychological resource and mental health research to a low- and middle-income country context, which is an essential step towards the evaluation of healthy and successful aging policies which have long been embraced in most Western countries (Ferri et al., 2009; Kleineidam et al., 2018). To the best of my knowledge, this is the first study investigating the moderating effect of SS in the relation between PA and PD, a surrogate of mental health in older adults in a sub-Saharan African context. Further, the study largely relied on validated instruments which have shown strong reliability and content validity in a number of previous analyses (e.g. Andrews & Slade, 2001; Department of Health & Social Care, 2013; Gyasi, Phillips, Abass, 2018; Victorian Population Health Survey, 2001). Additionally, data were obtained from a large representative population-based sample generated via a multistage probability selection and synthesized with multivariate modeling. The findings could, therefore, be generalizable upon the unknown older populations in Ghana and those elsewhere who share similar demographic, socioeconomic and cultural circumstances.

Despite the originality and novel contribution of this study, several limitations are notable. The cross-sectional and correlational survey design employed in this study, as the case maybe of all other cross-sectional analyses, means that causal conclusions cannot be drawn. This research design again rendered it impossible to evaluate any changes in study variables such as PD, SS and PA over time. Data generation was entirely based on self-reporting rather than clinical measures. This may have affected the veracity of the findings. However, prior studies conclude that social-health conditions such as psychological health, SS and extent of PA are better assessed through self-reporting. The findings may provide a baseline information for future potential research given that this topic remains highly unexplored in Ghana.

6. Conclusions and implications

This study examined complex relationships between interpersonal/psychologica resources and behavioral trajectories in relation to PD of community-dwelling older Ghanaians. The findings add to the gerontological literature by demonstrating that engagement in sustained and regular PA may potentially contribute to reducing PD among older persons. Moreover, SS not only improved mental health independently, but also moderated the PA-PD association, implying that older persons embedded in larger, stronger and meaningful constellation of relevant others are even less likely to experience PD. Psychological resources such as SS are, therefore, critical mechanisms for mental health as they may drive lifestyle behavioral interventions such as PA in later life. Interventions to reduce social isolation and sedentary behavior towards a more interpersonal ties and sustainable friendly PA among older persons are needed. New public health initiatives targeted at improving mental health should include old age PA dynamics and social connectedness. In the light of this, social policies such as neighbourhood/community-based services and *old-age friendly* infrastructure tailored to promote lifestyle and moderate-to-rigorous physical activity should be provided for older persons. These interventions may further improve existing social bonds while establishing new networks for older people. Finally, longitudinal analyses of the complex relationships of SS, PA and PD are strongly proposed to confirm the psychological health responses of PA and its interactions in sub-Saharan Africa, generally Ghana where evidence is sparse.

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Conflict of interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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References

Andrews, G., & Slade, T. (2001). Interpreting scores on the Kessler psychological distress scale (K10). *Australian and New Zealand Journal of Public Health, 25*(6), 494–497. https://doi.org/10.1111/j.1467-842X.2001.tb00310.x.

Back, J. H., & Lee, Y. (2011). Gender differences in the association between socio-economic status (SES) and depressive symptoms in older adults. *Archives of Gerontology and Geriatrics, 52*(3), e140–e144.

Biritwum, R. B., Mensah, G., Yawson, A., & Minicuci, N. (2013). *Study on global ageing and adult health (SAGE) wave 1: The Ghana national report*Geneva: World Health Organization.

Black, S. V., Cooper, R., Martin, K. R., Brage, S., Kuh, D., & Stafford, M. (2015). Physical activity and mental well-being in a cohort aged 60–64 years. *American Journal of Preventive Medicine, 49*(2), 172–180. https://doi.org/10.1016/j.amepre.2015.03.009.

Carlson, R. V., Boyd, K. M., & Webb, D. J. (2004). The revision of the declaration of Helsinki: Past, present and future. *British Journal of Clinical Pharmacology, 57*(6), 695–713. https://doi.org/10.1111/j.1365-2125.2004.02103.x.

Cohen, S., & McKay, G. (1984). Social support, stress and the buffering hypothesis: A theoretical analysis. *Handbook Psychology Health, 4*, 253–267.

Crooks, V. C., Lubben, J., Petitti, D. B., Little, D., & Chiu, V. (2008). Social network, cognitive function, and dementia incidence among elderly women. *American Journal of Public Health, 98*(7), 1221–1227.

Department of Health and Social Care (2013). *General physical activity questionnaire.* https://www.gov.uk/government/publications/general-practice-physical-activity-questionnaire-gppaq.

Fellendorf, F. T., Kainzbauer, N., Platzer, M., Dalkner, N., Bengesser, S. A., Birner, A., et al. (2017). Gender differences in the association between physical activity and cognitive function in individuals with bipolar disorder. *Journal of Affective Disorders, 221*, 232–237. https://doi.org/10.1016/j.jad.2017.06.048.

Ferri, C., James, I., & Pruchno, R. (2009). Successful aging: Definitions and subjective assessment according to older adults. *Clinical Gerontologist, 32*, 379–388. https://doi.org/10.1080/07317110802677302.

Foster, L., & Walker, A. (2015). Active and successful aging: A European policy perspective. *The Gerontologist, 55*(1), 83–90. https://doi.org/10.1093/geront/gnu028.

Ghana Statistical Service (2012). *Population and housing census, 2010 summary of report of final results*Accra, Ghana: Ghana Statistical Service.

Gyasi, R. M. (2018). *Ageing, health and health-seeking behaviour in Ghana*PhD thesis Hong Kong: Lingnan University. Retrieved from http://commons.ln.edu.hk/post_otd/.

Gyasi, R. M., & Phillips, D. R. (2018). Gender, self-rated health and functional decline among community-dwelling older persons. *Archives of Gerontology and Geriatrics, 77*, 174–183. https://doi.org/10.1016/j.archger.2018.05.010.

Gyasi, R. M., Phillips, D. R., & Abass, K. (2018). Social support networks and psychological wellbeing in community-dwelling older Ghanaian cohorts. *International Psychogeriatrics*. https://doi.org/10.1017/S1041610218001539.

Gyasi, R. M., Phillips, D. R., & Buor, D. (2018). The role of a health protection scheme in health services utilisation among community-dwelling older persons in Ghana. *The Journals of Gerontology: Series B*. https://doi.org/10.1093/geronb/gby082.

Hajek, A., Brettschneider, C., Lange, C., et al. (2015). Gender differences in the effect of social support on health-related quality of life: Results of a population-based prospective cohort study in old age in Germany. *Quality of Life Research, 25*, 1159–1168.

Herrman, H., Patrick, D. L., Diehr, P., Martin, M. L., Fleck, M., Simon, G. E., et al. (2002). Longitudinal investigation of depression outcomes in primary care in six countries: The LIDO Study. Functional status, health service use and treatment of people with depressive symptoms. *Psychological Medicine, 32*(5), 889–902. https://doi.org/10.1017/S003329170200586X.

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine, 7*(7), e1000316.

Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S.-L. T., et al. (2002). Short screening scales to monitor population prevalence and trends in non-

specific psychological distress. *Psychological Medicine, 32*, 959–976. https://doi.org/10.1017/S0033291702006074.
Kim, J. I. (2013). Social factors associated with centenarian rate (CR) in 32 OECD countries. *BMC International Health and Human Rights, 13*, 16. https://doi.org/10.1186/1472-698X-13–16.
Kleineidam, C., Thoma, M. V., Maercker, A., Bickel, H., Mösch, E., Hajek, A., et al. (2018). What is successful aging? A psychometric validation study of different construct definitions. *The Gerontologist*. https://doi.org/10.1093/geront/gny083.
Lautenschlager, N. T., Almeida, O. P., Flicker, L., & Janca, A. (2004). Can physical activity improve the mental health of older adults? *Annals of General Hospital Psychiatry, 3*, 12. https://doi.org/10.1186/1475-2832-3-12.
Lee, I. M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., Katzmarzyk, P. T., et al. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. *Lancet (London, England), 380*, 219–229. https://doi.org/10.1016/S0140-6736(12)61031-9.
Litwin, H. (2012). Physical activity, social network type and depressive symptoms in late life: An analysis of data from the National Social Life, Health and Aging Project. *Aging & Mental Health, 16*(5), 608–616. https://doi.org/10.1080/13607863.2011.644264.
Lwanga, S., & Lemeshow, S. (1991). *Sample size determination in health studies: A practical manual.* Geneva: World Health Organization23–30.
McAuley, E., & Rudolph, D. (1995). Physical-activity, aging, and psychological well-being. *Journal of Aging and Physical Activity, 3*, 67–96.
Menec, V. H. (2003). The relation between everyday activities and successful aging: A 6-year longitudinal study. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 58*, S74–S82. https://doi.org/10.1093/geronb/58.2.S74.
Musick, M., & Wilson, J. (2008). *Volunteering: A social profile.* Bloomington: Indiana University Press.
Parker, A. G., Hetrick, S. E., Jorm, A. F., Mackinnon, A. J., McGorry, P. D., Yung, A. R., et al. (2016). The effectiveness of simple psychological and physical activity interventions for high prevalence mental health problems in young people: A factorial randomized controlled trial. *Journal of Affective Disorders, 15*(196), 200–209. https://doi.org/10.1016/j.jad.2016.02.043.
Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: A review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry, 18*, 189–193.
Rodriguez, F. S., Pabst, A., Luck, T., Konig, H.-H., Angermeyer, M. C., Witte, A. V., et al. (2018). Social network types in old age and incident dementia. *Journal of Geriatric Psychiatry and Neurology, 31*(4), 163–170. https://doi.org/10.1177/0891988718781041.
Rowe, J. W., & Kahn, R. L. (1987). Human aging: Usual and successful. *Science (New York, N.Y.), 237*, 143–149.
Stathi, A., Fox, K. R., & McKenna, J. (2002). Physical activity and dimensions of subjective well-being in older adults. *Journal of Aging and Physical Activity, 10*, 76–92.
Stoeckel, K. J., & Litwin, H. (2016). The impact of social networks on the relationship between functional impairment and depressive symptoms in older adults. *International Psychogeriatrics, 28*(1), 39–47.
Taaffe, D. R., Irie, F., Masaki, K. H., Abbott, R. D., Petrovitch, H., Ross, G. W., et al. (2008). Physical activity, physical function, and incident dementia in elderly men: The Honolulu-Asia Aging Study. *Journals of Gerontology: Biological Sciences and Medical Sciences, 63*, 529–535.
United Nations DESA (2017). *World population prospects-population division Esa.un.oRg. 2015-07-29.* Retrieved 29 September 2015https://esa.un.org/unPSD/wpp/.
Üstun, T. B., Chatterji, S., Mechbal, A., Murray, C. J. L., & WHS Collaborating Groups (2005). *WHO translation guidelines quality assurance in surveys: Standards, guidelines and procedures.* Chapter XGeneva: World Health Organization.
Victorian Population Health Survey (2001). *Melbourne: Department of human services, Victoria*.
Wassink-Vossen, S., Collard, R. M., Oude Voshaar, R. C., Comijs, H. C., de Vocht, H. M., & Naarding, P. (2014). Physical (in)activity and depression in older people. *Journal of Affective Disorders, 161*, 65–72. https://doi.org/10.1016/j.jad.2014.03.001.
Wen, C. P., Wai, J. P. M., Tsai, M. K., Yang, Y. C., Cheng, T. Y. D., Lee, M. C., et al. (2011). Minimum amount of physical activity for reduced mortality and extended life expectancy: A prospective cohort study. *The Lancet, 378*, 1244–1253. https://doi.org/10.1016/ S0140-6736(11)60749-6.
WHO (2012). *The world health organization disability assessment schedule II (WHODAS II).* Retrieved fromhttp://www.who.int/icidh/whodas/index.html.
WHO (2015). *World report on ageing and health*Available at: Geneva: WHO. (Accessed: 18 October 2016) http://www.who.int/ageing/events/world-report-2015-launch/en/.
Yang, Y. C., Boen, C., Gerken, K., Li, T., Schorpp, K., & Harris, K. M. (2016). Social relationships and physiological determinants of longevity across the human life span. *Proceedings of the National Academy of Sciences of the United States of America, 113*(3), 578–583.
Zivin, K., Llewellyn, D. J., Lang, I. A., Vijan, S., Kabeto, M. U., Miller, E. M., et al. (2010). Depression among older adults in the United States and England. *American Journal of Geriatric Psychiatry, 18*(11), 1036–1044.