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Psychological distance of climate change and mental health risks assessment of smallholder farmers in Northern Ghana: Is habituation a threat to climate change?

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ABSTRACT

Although strong evidence shows climate change has physical impacts on human health, the mental health impacts appear unclear. The study aims to understand and explain the dynamic correlates between climate change and farmers' emotional regulation practices, given psychological distance. Using 180 smallholder farmers in Northern Ghana, structural equation linear regression analysis showed that given psychological distance (geographical, social), different climate change indicators significantly influenced different emotional regulation practices among farmers. Although, studies show an association between climate change and climate change adaptation practices, the study revealed that, given psychological distance, emotional regulations of farmers predicted their preferences for different climate change adaptation techniques. It is concluded that the influence of climate change on farmers' emotional regulation practices seems to predispose them to future mental (emotional) health problems. Emotional regulation also appears to be a significant factor that climate change and mental health interventionists need to pay attention to.

1. Introduction

The relationship between climate change and psychological health have been under investigated (McMichael et al., 2003; Swim et al., 2011; Swim and Becker, 2010) and the association between climate change and mental health needs further research (Bourque and Willox, 2014). Existing studies show that climatic changes appear to influence human health in various ways (IPCC, 2014; Honda et al., 2013; Costello et al., 2009; Frumkin et al., 2008; St. Louis and Hess, 2008; Parkinson and Butler, 2005). For instance, anthropogenic climate change impacts have been linked to psychological disorders in humans including anxiety, mood disorders, stress, depression, post-traumatic stress disorders, violence and feeling of hopelessness (Willox et al., 2013; Coyle and Susteren, 2012; Doherty and Clayton, 2011; Berry et al., 2010). Similarly, fear, despair, suicidal ideation, increased drug abuse, and heat related deaths have been linked to adverse climatic changes (Honda et al., 2013; Swim et al., 2011; Page and Howard, 2010; Fritze et al., 2008).

Climate change affects people through different environmental changes including acute weather events, sub-acute weather events, and long-term weather events (Willox et al., 2013; Swim et al., 2011; Doherty and Clayton, 2011; Berry et al., 2010). Acute impacts often include events such as floods, forest fires and hurricanes (example, recent hurricane Irma in the U.S.A.) that expose

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people to immediate mental injuries (Page and Howard, 2010; Costello et al., 2009). Sub-acute impacts involve intense emotions associated with people vicariously witnessing climate change effects; anxiety related to uncertainty regarding the magnitude of current and future risks that humans and other species may face (Maibach et al., 2008). Long-term environmental impacts involve large-scale social and community effects manifesting in the forms of heat-related violence, conflicts over scarce resources (Reuveny, 2007), displacement and involuntary migration (Agyeman, Devine-Wright, and Prange, 2009), post-disaster adjustment (Pfefferbaum et al., 2008), and chronic environmental stress (Albrecht and Mundlos, 2005). These events often result in loss of livelihoods, reduced socio-economic activities, and loss of sense of place which may exacerbate mental health risks. Risk analysis has shown that farmers' psychological distance of climate change affects their level of preparedness to act on climate change activities and concern about climate change events (King et al., 2015; Spence et al., 2011).

In Northern Ghana, smallholder farmers appear to be at a higher risk of suffering acute, sub-acute, and long-term impacts of climate change events due to the peculiar environmental challenges they face (Dumenu and Obeng, 2016). Northern Ghana's savanna landscape is mainly an arid zone with severe droughts, and the rising climate change levels continually exposes smallholder farmers to adverse climatic conditions including poor rainfall patterns, forest fires, soil erosion, and loss of soil fertility, poor harvest, and destruction of property and livestock (Wossen and Berger, 2015; Wossen et al., 2014; Venot et al., 2012). Thus, the chronically rising pace of changing climatic conditions is an emerging threat to the mental health of farmers (Laube et al., 2012). Climate change has and will continue to alter the hopes and expectations of farmers in the area as more futuristic cataclysmic climate change impacts are expected (Venot et al., 2012). Therefore, it appears calling for a closer focus on climate change as an emerging mental (i.e. emotional) health stressor (Willox et al., 2013) indeed remains an important foci for research.

The nuance and novelty of this study is to understand and explain the dynamic correlates between climate change and farmers' emotional regulation practices, given their psychological distance of climate change. This is important because, smallholder farmers' individual cognitive functioning and emotional regulation differences might predict successful coping with emotional challenges caused by climate change and the onset of mental (i.e. emotional) disorders (Kjellstrom et al, 2013; Orru et al., 2013). Priority is on identifying climate change indicators, challenges, and adaptation strategies that influence the adoption of maladaptive emotional regulation styles among small scale farmers.

2. Literature review

2.1. Emotional regulation

Emotional regulation is said to be the mental process by which individuals determine which emotions they go through, when these emotions occur, and how they are experienced and expressed. Affective styles on the other hand, deal with individual variances in famers' level of emotional sensitivity and regulation (Davidson, 1998). Not all forms of emotional regulation practices are growth-promoting and progressive, others have unintended counterproductive psychological outcomes. For instance, attempts to suppress one's emotions and/or excogitating over past or present negative emotional experiences increases psychological arousal and prolong negative emotional states (Rusting and Nolen-Hoeksema, 1998; Gross and Levenson, 1997; Nolen-Hoeksema and Morrow, 1993). Inversely, an accepting attitude toward emotional events tend to increase emotional resilience and reduce mental distress (Hayes et al., 2006). Gross and Levenson (1997), argue that emotional regulation processes can be grouped based on the time point at which people engage in them during the emotion generation process and the efficacy of these efforts. Some people engage in antecedent-focused emotional regulation activities including selective attention, situation modification and situational cognitive reframing, while others adopt response-focused emotional regulation by engaging in activities like emotional suppression and acceptance-based attitudes (ibid). Gross and John (2003) further indicate that individuals differ based on their habitual use of antecedent and response-focused emotional regulations strategies. Those who rely on cognitive reappraisal methods report improved social functioning and well-being, while those who use emotional suppression strategies tend to have decreased social functioning and poor well-being (ibid).

Mennin et al. (2002a,b, p. 88) advanced that, given antecedent and response-focused emotional regulation strategies, people tend to engage in varying affective styles including concealing, adjusting, and tolerating. Concealing and tolerating strategies (response-focused) are counterproductive as individuals either attempt to suppress and avoid emotions or remain comfortable and non-defensive in response to occurring emotional experiences after they occur (ibid). These maladaptive approaches induce learned helplessness, create a retrogressive "psychological insulation" and promotes persistent suffering (Kjellstrom et al, 2013; Orru et al., 2013; Salovey et al., 1995). In contrast, some people are able to access and utilize emotional information in adaptive problem-solving ways, and appropriately regulate emotional experiences and expression based on demands of each context (Mennin et al., 2002a,b). They have the needed psychological skills to readjust or balance emotions to appropriately maneuver the rewards and punishments of daily life (Mennin et al., 2002a,b). This provides a psychological buffer that promotes personal growth, builds resilience, and increases well-being.

2.2. Climate Change, psychological distance and emotional regulation

Despite limited literature, evidence seems to show an association between psychological distance of climate change and emotional regulation (Dittrich et al., 2016; King et al., 2015). Psychological distance refers to individuals' perception of climate change events as close to or far away from them (Liberman and Trope, 2008). This includes temporal, spatial/geographical, social, and hypothetical distances. Perceptions of psychological closeness of climate change for instance, motivate farmers in Kenya, Zimbabwe, Uganda,

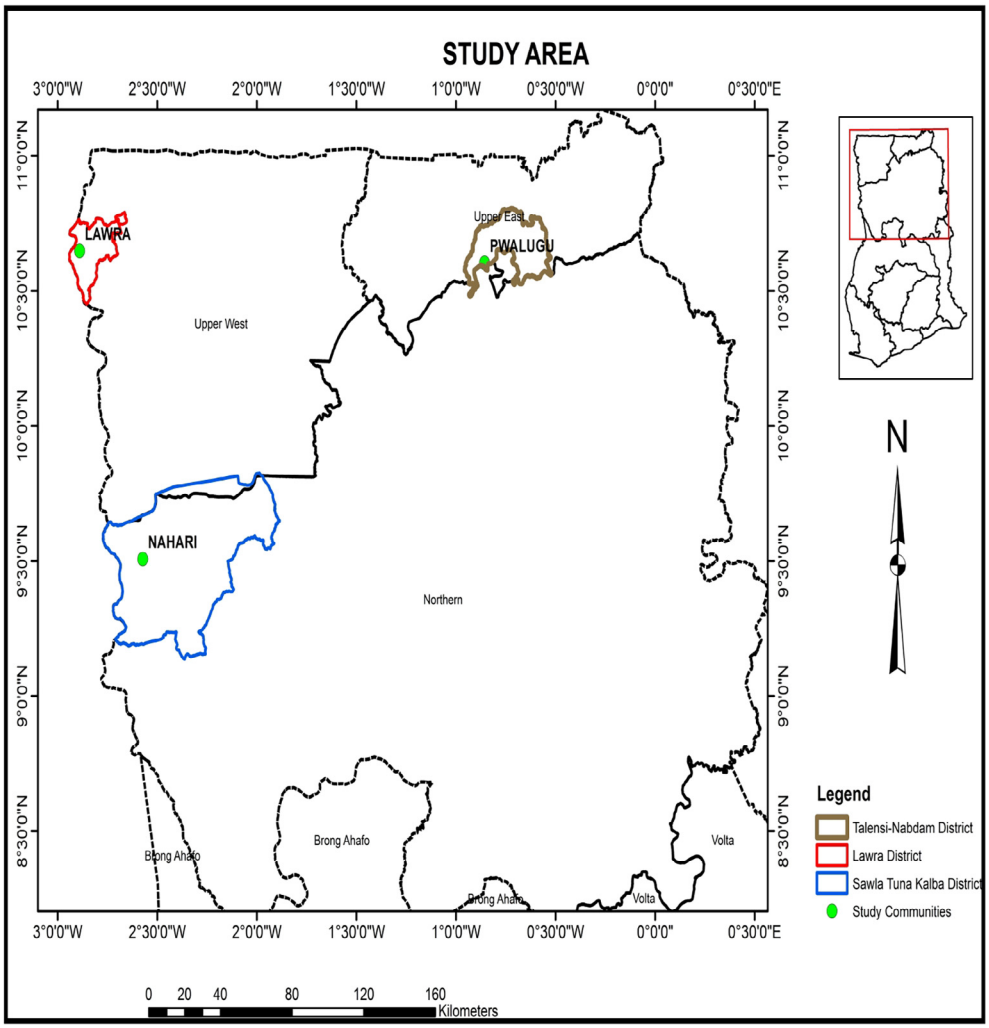

Fig. 1. Study Location Map Source: Geographic and Information Services, University of Ghana.

Brazil, and Indonesia to engage in various climate change adaptation strategies (Le Tourneau, 2015; Bryan et al., 2013; Berrang-Ford et al., 2012; Mutekwa, 2009). Psychological distance thus, appears to influence farmers' emotional states and regulation styles by inducing feelings of uncertainty and anticipation of the unknown. For instance, studies show that projected negative future events stimulates feelings of alertness and constant monitoring of current and future events which in turn induces feelings of high job insecurity, anxiety, mental distress, depression, suicide ideation, and prolonged emotional stress (IPCC, 2014; Kjellstrom et al., 2013; Orru et al., 2013). Similarly, perceptions of future climatic changes and predicted disasters are found to be associated with increased family stress, drug abuse, trauma, and engagement in cognitive biases (Willox et al., 2013; Berrang-Ford et al., 2012). Psychological distance is seen influencing emotional processes by showing that self-distancing and abstract mind-set mental processes buffer against experiencing psychological trauma, reducing intrusive thoughts, and protecting people against future negative affect (Yazdanpanah et al., 2014; Manoj and Tsai, 2011; Spence, Poortinga, and Pidgeon, 2011; Ayduk and Kross, 2008, 2010).

3. Methodology

The study employed quantitative and qualitative approaches to data procurement and analysis. Data was sourced from smallholder farmers in the three regions of the north, Ghana. Specifically, the Talensi-Nabdam District in the Upper East Region, Sawla-Tuna Kalba in the Northern Region and Lawra District in the Upper West Region (see Fig. 1). These districts were selected due to their perceived climate change vulnerability and effects (MoFA, 2014). Maize, millet and yam farmers were used as a proxy for smallholder farmers due to the extensive production of these food crops within the areas. For the purpose of this study, the FAO (2010) definition of smallholder farmers is adopted, thus, smallholder farmers are farmers who farm plots of 2 ha or less and rely exclusively on family labor. The data collection was done by the researchers and assisted by two (2) carefully chosen and well trained field assistants. A convenience sampling technique was used to select 180 farmers, 60 farmers from each district. The convenience sampling approach

was appropriate because no lists of farmers (sample frame) in the areas existed hence did not offer opportunity for probability sampling. However, disproportionate allocation was made to the districts to ensure representativeness.

A semi-structured questionnaire was used in soliciting the information. The divisions of the questionnaire were from section A to D. Section "A" collected information on the mental health risks of farmers. A psychological affective style modeling scale with 1 = not true of me all and 5 = extremely true of me was employed. The variables were then given a straight-forward score with the sum of items 1, 5, 9, 10, 13, 15, 18, and 20 for concealing, adjusting the sum of items 2, 4, 7, 8, 12, 16, and 19 and tolerating the sum of items 3, 6, 11, 14, and 17. Section B was on psychological distance of climate change which included geographical and social, and section C was on issues of climate change and adaptation and section D looked at the background characteristics of respondents.

A linear regression using a structural equation decomposition approach was used to model the antecedents of smallholder farmers' emotional regulation practices, given their psychological distance of climate change as a moderator. An emotional average index score involving concealing, adjusting and tolerating was computed. A psychological distance index was also computed from three sub-dimensions namely geographical and social.

The structural approach enabled a simultaneous testing of the direct and indirect paths of the variables involved. Two forms of simultaneous models were employed. Model 1 formulated the direct effects of five exogenous variables namely climate change, effects of climate, adaptation practices, adaptation constraints and psychological distance on the endogenous outcome: emotional regulation. Model 2 examined the indirect effects of some of the endogenous variables of which psychological distance served as the moderator. Similarly, the indirect effect of psychological distance on emotional regulation was also explored with climate change adaptation strategies as moderators. Emotional regulation was predicted both at the aggregate and disaggregate levels: conceal, adjust and tolerate. Gender base analysis was done to enrich the value of the results through personal interviews with a number of female farmers in the area. This was to present a clearer picture of the psychological effects of climate change on women as they are already challenged with land ownership. The resulted R^2s both at the aggregate and disaggregated models indicate that the exogenous variables are significant and fitted predictors of variance in emotional regulation of smallholder farmers. These were further confirmed by all post-estimations tests (such as margins) carried. All estimations were carried out using STATA 15. A structural

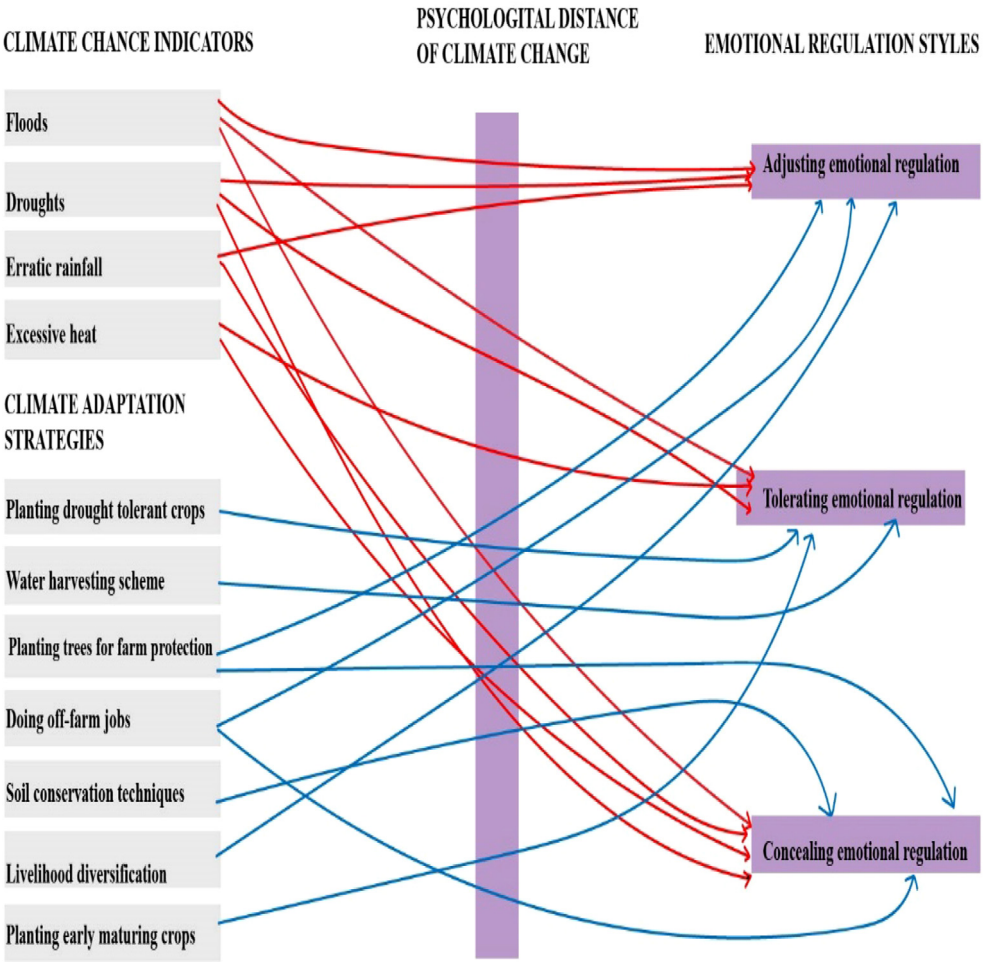

Fig. 2. A developed conceptual framework based on the findings.

Table 1
Psychological distance of farmers.

Geographical distance	Mean	Std	S.E
MY local area is likely to be affected by climate change	1.20	0.40	0.04
Climate change will mostly affect areas that are far away from here	4.00	1.24	0.11
Social distance			
Climate change will mostly affect developing countries	1.40	1.00	0.01
Climate change is likely to have a big impact on people like me	1.50	1.06	0.10

Two psychological distance variables were used (geographical and social distance) to measure how farmers perceive the occurrence of climate change. Geographical distance measures the perception of climate change based on geographical location whereas social distance measures perception on the category of people most likely to be affected my climate change. The Likert scale 1 = strongly agree, 2 = agree, 3 = moderately agree, 4 = disagree and 5 = strongly disagree was used to measure responses.

equation modeling presented a conceptual framework based on a summary of the findings to serve as a blueprint for the assessment of psychological distance of climate change and mental risks of farmers (see Fig. 2).

4. Results

The mean age was 38 years and mean farm acres 3. Geographically, respondents agreed their local area is likely to be affected by climate (Mean = 1.20) and disagreed that climate change will mostly affect areas that are far away from home (Mean = 4.00) as shown in Table 1: We are already feeling the effects of climate change (98.8%) and climate change is entirely human activity (66.7%) were acknowledged as temporal and uncertainty issues (1).

Respondents experienced excessive heat, declined in rainfall and prolonged drought (Table 2) which resulted in low yield/productivity and destruction of farmlands and property. Implementation of soil conservation techniques, building of water harvesting schemes and involvement in off-farm jobs were among the major adaptation practices implemented by farmers. Farmers were hindered by lack of finance, increased cost of production and inadequate education on climate change in their quest to engage in climate change adaptation (Table 3). From Table 4, Climate change indicators including excessive heat ($\beta = 17.85$) erratic rainfalls ($\beta = 7.95$) and droughts ($\beta = 4.92$) are observed as direct correlates of emotional regulation among smallholder farmers. The results further indicate that psychological distance positively moderates the relationship between climate change signs and emotional regulation strategies. Psychological closeness to floods and excessive heat for instance significantly influenced farmers' emotional outcomes. Floods had an inverse relationship with adjusting of emotions ($\beta = -10.9$) and positively predicted tolerating ($\beta = 1.64$). However psychological distance negatively moderated the association between floods and concealing ($\beta = -3.08$). Also, Psychological distance positively moderated farmers' experience of excessive heat and that of concealing ($\beta = 2.78$) and inversely predicted tolerating ($\beta = -2.33$). It could also be seen from the table that in experiencing drought farmers tend to engage more in all the three dimensions of emotional regulation (concealing ($\beta = 11.81$), adjusting ($\beta = 6.87$), tolerating ($\beta = 4.00$)) given psychological distance. Furthermore, erratic rainfall positively predicted an increase in farmers adoption of the concealing ($\beta = 8.16$) and adjusting ($\beta = 14.08$) emotional regulation dimensions.

Climate change adaptation strategies significantly moderated the impacts of farmers' perceptions of climate change on their

Table 2
Experience with climate change.

Experience with climate change	Frequency	Percentage
Excessive heat	116	26.60
Declined in rainfall	111	25.45
Prolonged drought	101	23.16
Excessive floods	78	17.90
Strong winds occurrence	30	6.90
Total	436	100
Effects of climate change		
Low yield/productivity	208	51.7
Destruction of farmlands and property	96	23.8
Affects water availability	56	13.9
Rise in temperature	42	10.4
Total	402	100.0

Examined farmers' experiences of climate change and the effects on their activities. For experience of climate change, respondents were asked to tick which of the climate change indicators (excessive heat, declined rainfall, prolonged drought, excessive floods and strong winds) they are currently experiencing. Again, respondents were asked to tick the effects they are currently confronted with (low yield/productivity, destruction of farmlands and property, water availability and rise in temperature). The multiple response approach was use, the approach allows for respondents to tick more than one answer option to a question.

Table 3
Adaptation practices.

Adaptation practices	Yes	No
Early maturing/drought tolerant crops	55.8	44.2
Built a water-harvesting scheme/irrigation	65.0	35.0
Implemented soil conservation techniques	75.0	25.0
Plant tress for farm protection	58.3	41.7
Involved in off-farm jobs	68.3	31.7
Livelihood diversification	30.0	70.0
Mixed cropping	35.8	64.2
Challenges with adaptation	Frequency (n)	Percentage (%)
Lack of finance	80	44.4
Increased cost of farming	65	36.1
Inadequate education on climate change	25	13.8
Conflicts among farmers for resource use	10	5.5
Total	180	100

emotional regulation. This was particularly the case for farmers who adopted soil conservation techniques (β = 14.11), trees planting (β = 5.77), mixed cropping (β = 3.76), early maturing/drought tolerant crops (β = 1.92) and off farm jobs (β = 1.36). Given psychological distance, early maturing/drought tolerant crops (β = −0.88) and water harvesting scheme (β = −0.48) however inversely predicted the emotional regulation variable, tolerate. Similarly, given psychological distance, planting trees for farm protection (β = −1.12), and doing off-farm jobs (β = −0.79) both had a significant negative association with the adjusting emotional regulation style while livelihood diversification positively predicted this variable (β = 0.62). Contrary, moderated by psychological distance, soil conservation techniques (β = 5.27), planting trees for farm protection (β = 3.45) and off-farm jobs (β = 0.70) positively predicted concealing.

5. Discussion

The mental (i.e. emotional) health of smallholder farmers is a crucial mental health care task because of the socio-economic role farmers' play in national development. Nonetheless, there appears to be tokenistic research in the area, especially in Ghana, a country with half of its population engaged in subsistence farming (Dumenu and Obeng, 2016; Bourque and Willox, 2014; Swim and Becker, 2010, Swim et al., 2011; Venot et al., 2012; McMichael et al., 2003). Farmers' high dependency on the environment as a source of livelihood makes them more vulnerable to environment-induced mental health risks (Wossen and Berger, 2015; Spence, Poortinga, and Pidgeon, 2011). Thus, there is a need to identify and understand the environmental and psychological predictors of mental well-being among smallholder farmers (IPCC, 2014; Honda et al., 2013; Costello et al., 2009; Frumkin et al., 2008; St. Louis and Hess, 2008; Parkinson and Butler, 2005). The paper presents detailed discussions in two folds; firstly, the associations between some climate change indicators (floods, excessive, heat, and erratic rainfall), psychological distance, and emotional regulations (concealing, adjusting, tolerating) and, secondly the influence of climate change adaptation practices, climate change challenges, and psychological distance on emotional regulation.

5.1. Climate change and emotional regulation

Similar to existing studies, this study found that psychical climate change indicators including heat level, rainfall pattern, and drought influenced individuals' psychological believes (Willox et al., 2013; Coyle and Susteren, 2012; Doherty and Clayton, 2011; Berry et al., 2010). Furthermore, it was discovered that psychological distance played a significant role in how these climate change indicators influenced farmers' emotional regulation (Le Tourneau, 2015; Yazdanpanah et al., 2014; Manoj and Tsai, 2011; Ayduk and Kross, 2008, 2010). Interestingly, it was found that, given psychological distance (geographical, social), different climate change indicators (excessive heat, floods, drought) predicted different emotional regulation styles among farmers. This seems to presuppose that different climate change impacts (acute, vicarious, and long-term) seem to influence farmers' emotional regulations preferences (Willox et al., 2013; Swim et al., 2011; Doherty and Clayton, 2011; Berry et al., 2010).

The study discovered that, given psychological distance, experience of floods reduced farmers' use of adjusting and concealing emotional regulations styles, and increased their engagement in tolerating. Similarly, farmers engaged more in concealing and less in tolerating with the experience of excessive heat. Erratic rainfall was no different as it correlated with increased use of concealing and adjusting emotional regulation styles. However, given psychological distance, experience of drought influenced more engagement in all three emotional regulations styles. This seems to suggest that farmers may be experiencing difficulty in identifying the right emotional regulation technique to deal with drought experiences (Gross and Levenson, 1997). This was more of a concern to female farmers especially as some of them lamented; …….*as you can see, this time, the rain is no longer coming and the area remains dry for most part of the year. The drought is a major problem here and we do not know what to do about it. We can't even cultivate, we only sit and wait for the rain. Animals cannot also get water to drink because most of the streams are now dried up. I sit here (under a mango tree) thinking a lot about my family and my farm and I sometimes get depressed because of this*….(Female farmer 1).

Table 4
Climate change, psychological distance and emotional regulation.

Antecedent	Path	Moderator	Dependent variable Emotional regulation	
Evidence of climate change			Direct (λ)	Indirect (λ)
Winds (ref)				
Floods	→	PYSDIS	−4.92**	−0.24
Excessive heat	→	PYSDIS	−17.85**	−1.95*
Drought	→	PYSDIS	−2.89	3.22**
Erratic rainfall	→	PYSDIS	7.95**	0.03
Effects of climate change				
Destruction of farmland (ref.)				
Low productivity	→	PYSDIS	0.23	−0.44
Shifts in water availability	→	PYSDIS	0.59	−0.54
PYSDIS	→		4.09**	
PYSDIS	→	Early maturing/drought tolerant crops		1.92**
PYSDIS	→	Built a water-harvesting scheme/irrigation		1.54**
PYSDIS	→	Implemented soil conservation techniques		14.11**
PYSDIS	→	Plant tress for farm protection		5.77**
PYSDIS	→	Involved in off-farm jobs		1.36**
PYSDIS	→	Livelihood diversification		1.09**
PYSDIS	→	Mixed cropping		3.76**
Challenges of climate change adaptation				
Inadequate education on climate change (ref.)				
Increased cost of faming	→		−8.41**	
Inadequate of finance	→		−5.95**	

Antecedent	Path	Moderator	Concealing		Adjust		Tolerate	
			Direct	Indirect	Direct	Indirect	Direct	Indirect
Evidence of climate change								
Winds (ref)								
Floods	→	PYSDIS	−4.46	−3.08**	−10.9**	−0.74	0.68	1.64**
Excessive heat	→	PYSDIS	−16.12**	2.78**	−28.59**	1.82	−8.84**	−2.33**
Drought	→	PYSDIS	2.84	11.81**	−12.15**	6.87**	0.63	4.00**
Erratic rainfall	→	PYSDIS	8.16***	1.50	14.08**	0.54	1.62	−1.96
Effects of climate change								
Destruction of farmland (ref.)								
Low productivity	→	PYSDIS	−0.44	0.20	0.18	0.10	0.32	−0.51
Shifts in water availability	→	PYSDIS	−0.54	−0.34	0.64	0.62	0.79	0.54
PYSDIS								
PYSDIS	→	Early maturing/drought tolerant crops		0.23		0.12		−0.88**
PYSDIS	→	Built a water-harvesting scheme/irrigation		−0.51		−0.87*		−0.48*
PYSDIS	→	Implemented soil conservation techniques		5.27**		4.09**		1.92
PYSDIS	→	Plant tress for farm protection		3.45**		−1.12**		−0.26
PYSDIS	→	Involved in off-farm jobs		0.70*		−0.79*		−0.46
PYSDIS	→	Livelihood diversification		−0.02		0.62*		−0.06
PYSDIS	→	Mixed cropping		−0.02		−0.04		4.09**
Challenges of climate change adaptation								
Inadequate education on climate change (ref.)								
Increased cost of faming	→		7.15***		7.15***		−2.88	
Inadequate of finance	→		2.64*		2.64*		−4.43	
Inadequate knowledge on adaptation	→		−0.75		−0.75		0.04	

PYSDIS = psychological distance.
*Indicates significant at 95% confidence level and **significant at 99% confidence level. The relevance is that 99% indicates a more stronger influence of the predictor variable on the outcome variable as compared to 95% significant level.

Increased tolerance and concealing means farmers passively accept, act non-defensively, or try to suppress and avoid climate change-induced emotional challenges, whereas engaging more in adjusting allows them to focus on accessing their emotional challenges and appropriately using such information to solve farming-related problems (Gross and John, 2003; Mennin et al., 2002a,b). Concealing and tolerating such challenges are maladaptive as they often demotivates self-initiative to reduce persisting suffering, "*psychologically insulate*" farmers from acting in proactive ways to prevent future flood-induced emotional suffering, and reduces their social functioning and well-being (Mennin et al., 2002a,b; Salovey et al., 1995). In contrast, adjusting is a healthy antecedent-focused approach and enables farmers to build good cognitive skills in navigating negative daily drought-induced emotional experiences, hence making them more resilient to climate change and mentally healthy (Mennin et al., 2002a,b, p. 88).

Climate change indicators increased the use of maladaptive response-focused emotional regulation strategies (concealing, tolerating) among farmers, although, erratic rainfall and drought, to some extent, concurrently influenced more engagement in antecedent-focused style (adjusting). Therefore, climate change influences a rise in use of counterproductive emotional regulation strategies that may prone farmers to developing mental (i.e. emotional) disorders. Psychological distance plays a crucial role in this link (Yazdanpanah et al., 2014; Manoj and Tsai, 2011; Spence, Poortinga, and Pidgeon, 2011; Ayduk and Kross, 2008, 2010). This also corroborates what one of the female farmers said; …….*it is true that the rains are not coming like they used to. Sometimes it will not rain for a very longtime and when the rains finally come, our farmlands are destroyed due to flooding. For me I think the weather has changed totally and it is worrying us too much. However, as a woman you just have to keep quiet and replant in the next season. The men can seek help from MoFA and NGOs but we the women cannot even express our feelings because the men control everything.*…(Female farmer 2).

5.2. Emotional regulation and climate change adaptation practices

Although, psychological distance has been associated with climate change adaptation practices of farmers (Dittrich et al., 2016; Bryan et al., 2013; Berrang-Ford et al., 2012; Mutekwa's, 2009), there appears to be no evidence indicating how emotional regulation influences the kind of climate change adaptation practices farmers implement. The study revealed that, given psychological distance, farmers who engaged in tolerating when faced with climate change-induced emotional experiences were less likely to engage in climate change adaptation practices including sowing early maturing/drought resistant crops, soil conservation, tree planting, mixed cropping, and doing off-farm jobs. Furthermore, farmers who used adjusting emotional regulating strategies engaged less in tree planting and doing off-farm jobs, while being more likely to practice livelihood diversification. In addition, the study showed that a farmer who concealed also reported an increase in practicing soil conservation techniques, planting trees, and doing off-farm jobs. These findings are interesting as seem to relate to the climate change indicators. It could be suggested that these climate change adaptation practices are simply being motivated by the kind of climate change events encountered and not by emotional regulation strategies. For example, experience of floods is related with increased use of practices including early maturing/drought resistant crops, soil conservation, tree planting, mixed cropping, and doing off-farm jobs….*Every year we experience floods in this area and our farms and other properties are always destroyed. Because of that some of us use the early maturing maize (Wangdata) which has been provided by some NGOs. This type of maize can grow and produce well with little rain, so before the floods come we have already harvested. This has really helped us a lot. I also cook food and sell at the Basic School to make additional income for my family likewise some of the other women* (Female farmer 3).

However, another explanation may be that peculiar characteristics of the various emotional regulation strategies may predispose farmers to choosing certain climate change adaptation practices. For instance, floods induce an increase use of tolerating which may imply that farmers in this category tend to passively resign to fate and act non-defensively towards climate change events. Hence, they may be less proactive and decline from adopting anti-climate change attempts to shield their farming activity from impacts of climate change. Also, famers who habitually concealed implemented more soil conservation techniques, planting trees, and doing off-farm jobs. Although counterproductive to mental/emotional well-being, emotional suppression or avoidance may result in increased ruminating over past and present negative emotional experiences, as well as uncertainty and fears of future climate change events which might keep them alert and compel a need to implement climate change adaptation techniques to protect themselves against unpredictable future climate-induced emotional suffering (Willox et al., 2013; Berrang-Ford et al., 2012). Furthermore, associated with erratic rainfall, emotionally adjusting farmers practiced more of livelihood diversification. This is in line with characteristics of the emotionally adjusting dimension as individuals engaged in it are found to have better social functioning than the other two emotional regulation styles (Mennin et al., 2002a,b). Their ability to access and utilize personal emotional information and appropriately manage and express their emotional experiences may make them more successful in pursuing varied livelihood diversification opportunities compared to farmers with maladaptive emotional regulation strategies like concealing and tolerating. The foregoing seems to suggest that emotional regulation may be implicated in farmers' preferences of climate change adaptation techniques.

6. Conclusion and policy implication

Smallholder farming is a fundamental activity for mankind in the pursuit of poverty and sustainable development (Targowski, 2014; Godfray et al., 2010). In recent times, smallholding is at crossings due to the prevalence of climate-induced mental stress among farmers (IPCC, 2014; Kjellstrom et al., 2013; Orru et al., 2013). In a deeper assessment, the paper presents psychological distance of climate change and mental health risks of smallholder farmers. It established that psychological distance significantly mediated climate change indicators and farmers emotional regulation. Given psychological distance, different climate change indicators predicted different emotional regulation styles among farmers. Experience of floods reduced farmers' use of adjusting and concealing emotional regulation styles, and increased their engagement in tolerating. More concealing and less tolerating was found for excessive heat and erratic rainfall remained indifferent for concealing and adjusting. However, the experience of drought influenced more engagement in all three emotional regulation dimensions. The paper concludes that with the difficulty in identifying the appropriate emotional control for specific climate change situation further predisposes farmers to short-term mental stress and long-term acute mental health challenges. Understanding, the meditative potency of psychological distance between climate change and emotional regulation is paramount to appropriate climate change adaptation. Concealing and tolerating climate change challenges as found in the study are maladaptive as they often demotivates self-efficacy to reduce persistant suffering, act proactively to prevent future climate-induced challenges and reduce social functioning and well-being. The paper recommends strong and effective

policy interventions for developing mental health care for rural farmers. Mainstreaming the psychological impacts of climate change, raising awareness of mental health risks through both formal and non-formal education among farmers is also imperative to make farmers emotionally stable to adapt to climate change. Finally, international policy dialogues including the United Nations Conferences on Climate Change should place the mental health dimension of climate change effects at the core of discussions and commit substantial financial investment to mental health adaptation.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.crm.2018.04.002.

References

Agyeman, J., Devine-Wright, P., Prange, J., 2009. Close to the edge, down by the river? Joining up managed retreat and place attachment in a climate changed world. Environ. Plann. A 41 (3), 509–531.

Albrecht, A., Mundlos, S., 2005. The other trinucleotide repeat: polyalanine expansion disorders. Curr. Opin. Genet. Dev. 15, 285–293. http://dx.doi.org/10.1016/j.gde.2005.04.003.

Ayduk, O., Kross, E., 2008. Enhancing the pace of recovery: self-distanced analysis of negative experiences reduces blood pressure reactivity. Psychol. Sci. 19, 229–231.

Ayduk, O., Kross, E., 2010. Analyzing negative experiences without ruminating: the role of self-distancing in enabling adaptive self-reflection. Soc. Pers. Psychol. Compass 4 (10), 841–854. http://dx.doi.org/10.1111/j.1751-9004.2010.00301.x.

Berrang-Ford, L., Dingle, K., Ford, J.D., Lee, C., Lwasa, S., Namanya, D.B., Edge, V., 2012. Vulnerability of indigenous health to climate change: a case study of Uganda's Batwa Pygmies. Soc. Sci. Med. 75 (6), 1067–1077.

Berry, H.L., Bowen, K., Kjellstrom, T., 2010. Climate change and mental health: a causal pathways framework. Int. J. Publ. Health 55, 123–132.

Bourque, F., Willox, C.A., 2014. Climate change: the next challenge for public mental health? Int. Rev. Psychiatry 26 (4), 415–422.

Bryan, E., Ringler, C., Okoba, B., Roncoli, C., Silvestri, S., Herrero, M., 2013. Adapting agriculture to climate change in Kenya: household strategies and determinants. J. Environ. Manage. 114, 26–35.

Costello, A., et al., 2009. Managin the health effects of climate change. Lancet 373 (9676), 1693–1733. http://dx.doi.org/10.1016/S0140-6736(09)60935-1.

Coyle, K.J., Susteren, V.L., 2012. The psychological effects of global warming on the United States: and why the U.S. mental health care system is not adequately prepared. National Forum & Research Report: National Wildlife Federation Climate Education Program. Retrieved from < http://www.nwf.org/pdf/Reports/Psych_Effects > .

Davidson, R.J., 1998. Affective style and affective disorders: perspectives form affective neuroscience. Cogn. Emot. 12, 307–320.

Dittrich, R., Wreford, A., Moran, D., 2016. A survey of decision-making approaches for climate change adaptation: are robust methods the way forward? Ecol. Econ. 122, 79–89.

Doherty, T., Clayton, S., 2011. The psychological impacts of global climate change. Am. Psychol. 66 (4), 265–276.

Dumenu, W.K., Obeng, E.A., 2016. Climate change and rural communities in Ghana: social vulnerability, impacts, adaptations and policy implications. Environ. Sci. Policy 55, 208–217.

Food and Agriculture Organisation, 2010. The state of food insecurity in the world 2010. Retrieved from < www.fao.org/docrep > on Tuesday 2nd February, 2016 at 8:45am.

Fritze, J.G., Blashki, G.A., Burke, S., Wiseman, J., 2008. Hope, despair and transformation: climate change and the promotion of mental health and wellbeing. Int. J. Mental Health Syst. 2 (1), 13. http://dx.doi.org/10.1186/1752-4458-2-13.

Frumkin, H., Hess, J., Luber, G., Malilay, J., McGeehin, M., 2008. Climate change: the public health response. Geography, 26, 656–67. Am. J. Publ. Health 98 (3), 435–445. http://dx.doi.org/10.2105/AJPH.2007.119362.

Godfray, H.C.J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F., Toulmin, C., 2010. Food security: the challenge of feeding 9 billion people. Science 327 (5967), 812–818.

Gross, J.J., John, O.P., 2003. Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. J. Pers. Soc. Psychol. 85, 348–362.

Gross, J.J., Levenson, R.W., 1997. Hiding feelings: the acute effects of inhibiting negative and positive emotion. J. Abnorm. Psychol. 106, 95–103.

Hayes, S.C., Luoma, J., Bond, F., Masuda, A., Lillis, J., 2006. Acceptance and commitment therapy: model, processes, and outcomes. Behav. Res. Ther. 44, 1–25.

Honda, M., Kuwano, Y., Katsuura-Kamano, S., Kamezaki, Y., Fujita, K., Akaike, Y., ... Rokutan, K., 2013. Chronic academic stress increases a group of microRNAs in peripheral blood. PloS one 8 (10) e75960.

IPCC, 2014. Climate Change 2014–Impacts, Adaptation and Vulnerability: Global and Sectoral Aspects. Cambridge University Press.

King, T., Kilpatrick, S., Willis, K., Speldewinde, C., 2015. “A Different Kettle of Fish”: mental health strategies for Australian fishers, and farmers. Mar Policy 60, 134–140.

Kjellstrom, T., Lemke, B., Venugopal, V., 2013. Occupational Health and Safety Impacts of Climate Conditions. Elsevier, Climate Vulnerability. New York, pp. 145–156.

Laube, W., Schraven, B., Awo, M., 2012. Smallholder adaptation to climate change: dynamics and limits in Northern Ghana. Clim. change 111 (3–4), 753–774.

Le Tourneau, F.M., 2015. The sustainability challenges of indigenous territories in Brazil's Amazonia. Curr. Opin. Environ. Sustainability 14, 213–220.

Liberman, N., Trope, Y., 2008. The psychology of transcending the here and now. Science 322 (5905), 1201–1205.

Maibach, E.W., Chadwick, A., McBride, D., Chuk, M., Ebi, K.L., Balbus, J., 2008. Climate change and local public health in the United States: preparedness, programs and perceptions of local public health department directors. PLoS One 3 (7), 28–38. http://dx.doi.org/10.1371/journal.pone.0002838.

Manoj, T., Tsai, C.I., 2011. Psychological distance and subjective experience: how distancing reduces the feeling of difficulty. Forthcoming; Johnson School Research Paper Series No. 47-2011. Available at SSRN. J. Consumer Res.

McMichael, A., Campbell-Lendrum, D., Corvalan, C., Ebi, K., Githeko, A., Scheraga, J., Woodward, A., 2003. Climate Change and Human Health: Risks and responses. World Health Organisation, Geneva.

Mennin, D.S., Heimberg, R.G., Turk, C.L., Fresco, D.M., 2002a. Applying an emotion regulation framework to integrative approaches to generalized anxiety disorder. Clin. Psychol.: Sci. Pract. 9, 85–90.

Mennin, D.S., Heimberg, R.G., Turk, C.L., Fresco, D.M., 2002b. Commentary on Roemer and Orsillo: applying an emotion regulation framework to integrative approaches to generalized anxiety disorder. Clin. Psychol.: Sci. Pract. 9, 85–90.

Ministry of Food and Agriculture, 2014. The state of agriculture in Ghana. Retrieved from < http://www.ghanadistricts.com/districts > on December 14, 2016 at 9:45 am.

Mutekwa, V.T., 2009. Climate change impacts and adaptation in the agricultural sector: the case of smallholder farmers in Zimbabwe. Journal of Sustainable Development in Africa 11 (2), 237–256.

Nolen-Hoeksema, S., Morrow, J., 1993. Effects of rumination and distraction on naturally- occurring depressed mood. Cogn. Emot. 7, 561–570.

Orru, H., Andersson, C., Ebi, K.L., Langner, J., Åström, C., Forsberg, B., 2013. Impact of climate change on ozone-related mortality and morbidity in Europe. Eur. Respir. J. 41 (2), 285–294.

Page, L.A., Howard, L.M., 2010. The impact of climate change on mental health (but will mental health be discussed at Copenhagen?). Psychol. Med. 40 (2), 177–180.

Parkinson, A.J., Butler, J.C., 2005. Potential impacts of climate change on infectious diseases in the Arctic. Int. J. Circumpolar Health 64 (5), 478–486.
Pfefferbaum, R.L., Reissman, D.B., Pfefferbaum, B., Wyche, K.F., Norris, F.H., Klamp, R.W., 2008. Factors in the development of community resilience to disasters. In: Blumenfield, M., Ursano, R.J. (Eds.), Intervention and Resilience after Mass Trauma. Cambridge University Press, Cambridge, England, pp. 49–68.
Reuveny, R., 2007. Climate change-induced migration and violent conflict. Political.
Rusting, C., Nolen-Hoeksema, S., 1998. Regulating responses to anger: effects of rumination and distraction on angry mood. J. Pers. Soc. Psychol. 74, 790–803.
Salovey, P., Mayer, J.D., Goldman, S., Turvey, C., Palfai, T., 1995. Emotional attention, clarity, and repair: exploring emotional intelligence using the Trait Meta-Mood Scale. In: Pennebaker, J.W. (Ed.), Emotion, Disclosure, and Health. American Psychological Association, Washington, D.C., pp. 125–154.
Spence, A., Poortinga, W., Pidgeon, N., 2011. The psychological distance of climate change. Risk Anal. Int. J. 32 (6), 957–972. http://dx.doi.org/10.1111/j.1539-6924.2011.01695.x.
St. Louis, M.E., Hess, J.J., 2008. Climate change: impacts on and implications for Global Health. Am. J. Prev. Med. 35 (5), 527–538. http://dx.doi.org/10.1016/j.amepre.2008.08.023.
Swim, J.K., Becker, J., 2010. Individuals' efforts to mitigate global climate change: A comparison of U.S. versus German residents' engagement in direct and indirect energy reduction behaviors. Manuscript submitted for publication.
Swim, J.K., Clayton, S., Howard, G.S., 2011. Human behavioral contributions to climate change: psychological and contextual drivers. American Psychologist 66. http://dx.doi.org/10.1037/a0023472.
Targowski, A.S., 2014. The impact of agriculture on African civilization in the 21st century. Int. J. Afr. Dev. 2 (1), 4..
Venot, J., Fraiture, C.D., Acheampong, E.N., 2012. Revisiting Dominant Notions: A Review of Costs, Performance and Institutions of Small Reservoirs in Sub-Saharan Africa. http://dx.doi.org/10.5337/2012.202.
Willox, C.A., Harper, S., Ford, J., Landman, K., Houle, K., Edge, V., 2013. The Rigolet Inuit Community Government Climate change and mental health: a case study from Rigolet, Nun-atsiavut, Labrador, Canada. Clim. Change 121, 255–270.
Wossen, T., Berger, T., 2015. Climate variability, food security and poverty: agent-based assessment of policy options for farm households in Northern Ghana. Environ. Sci. Policy 47, 95–107.
Wossen, T., Berger, T., Swamikannu, N., Ramilan, T., 2014. Climate variability, consumption risk and poverty in semi-arid Northern Ghana: adaptation options for poor farm households. Environ. Dev. 12, 2–15.
Yazdanpanah, M., Hayati, D., Hochrainer-Stigler, S., Zamani, G.H., 2014. Understanding farmers' intention and behavior regarding water conservation in the Middle-East and North Africa: a case study in Iran. J. Environ. Manage. 135, 63–72. http://dx.doi.org/10.1016/j.jenvman.2014.01.016.