

**Title:** Investigating the interaction between sleep symptoms of arousal and acquired capability in predicting suicidality

**Running head:** Sleep Arousal And Acquired Capability

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**Abstract**

Heightened arousal significantly interacts with acquired capability to predict suicidality. We explore this interaction with insomnia and nightmares independently of waking state arousal symptoms, and test predictions of the Interpersonal Theory of Suicide (IPTS) and Escape Theory in relation to these sleep arousal symptoms. Findings from our e-survey (n= 540) supported the IPTS over models of Suicide as Escape. Sleep-specific measurements of arousal (insomnia and nightmares) showed no main effect, yet interacted with acquired capability to predict increased suicidality. The explained variance in suicidality by the interaction (1-2%) using sleep specific measures were comparable to variance explained by interactions previously reported in the literature using measurements composed of a mix of waking and sleep state arousal symptoms. Similarly, when entrapment (inability to escape) was included in models, main effects of sleep symptoms arousal were not detected yet interacted with entrapment to predict suicidality. We discuss findings in relation to treatment options suggesting that sleep specific interventions be considered for the long term management of at risk individuals.

**Key words:** Sleep disturbances, Acquired Capability, Suicidality

## **Introduction**

It is estimated that global suicide rates stand at 11.4 per 100000 and that suicide in 15 to 29 year olds is the second leading cause of death (World Health Organization, 2014). As an important public health issue worldwide, a key focus of suicide prevention efforts is the establishment of robust psychological variables to identify individuals at increased risk (Borges, Angst, Nock, Ruscio, & Kessler, 2008). This provides researchers with targets to develop effective psychological interventions and enables clinicians to identify at risk individuals early with a view to delivering such interventions. Symptoms of heightened arousal have been linked to completed suicide and near lethal attempts (Busch, Fawcett, & Jacobs, 2003). Individuals present as acutely agitated, restless, and exhibiting psychomotor agitation prior to these suicidal events. Emotional distress and racing thoughts are also frequently reported (Benazzi, Koukopoulos, & Akiskal, 2004).

Recently sleep related somatic symptoms of heightened arousal have been deemed increasingly useful predictors of increased suicidal risk (Pigeon, Pinguart, & Conner, 2012) and shown to outperform robust predictors of suicidal risk such as depression and hopelessness (Ribeiro et al., 2012). In particular, insomnia and nightmares have been shown to be significant predictors of suicidality (Bernert & Joiner, 2007; Bernert & Nadorff, 2015; McCall & Black, 2013). These somatic symptoms have provided additional risk factors for suicidal behaviour which are less prone to concealment efforts, than suicidal thoughts or intent, a common issue in suicide research (Nock et al., 2008).

Escape Theory (Baumeister, 1990) suggests suicidality increases due to the urge to escape distress (unpleasant heightened arousal). Hence, following this theory one would predict that nightmares or insomnia symptoms themselves would be sufficient to increase levels of suicidality. Contrary to Escape theory, the Inter-Personal Theory of Suicide (IPT; Joiner, 2009; Van Orden et al., 2010) predicts that symptoms of heightened arousal should only

increase suicidality if interacting with the acquired capabilities for suicide. Acquired capability, defined as a continuous construct, is the accumulation over one's life time of experiences increasing one's capacity to complete suicide. It incorporates suicide attempts as well as repeated painful or fear-inducing experiences such as non-suicidal self-injury or exposure to the pain and injuries of others (Joiner et al., 2009). Nadorff and colleagues explored the relationship between insomnia and nightmare symptoms on suicide risk and attempts (Nadorff, Anestis, Nazem, Harris, & Winer, 2014) as well as nightmare and insomnia duration on suicide risk (Golding, Nadorff, Winer, & Ward, 2015), testing if main effects remained beyond the IPTS. Results indicated nightmares to be independent of the IPTS while results were mixed for insomnia. Interaction effects between sleep variables and IPTS variables are not reported. However, recent studies have highlighted that somatic heightened arousal symptoms, interact with acquired capability for suicide in predicting increased suicide risk; in a military sample (Ribeiro, Bender, et al., 2014), and in an outpatient sample where arousal comprised of sleep disturbance and wakeful agitation symptoms (Ribeiro, Silva, & Joiner, 2014). Similarly, preceding nightmares have been shown to increase risk of self-harmful thoughts and behaviors upon waking in individuals with a pre-existing history of self-harm (Hochard, Heym, & Townsend, 2015).

Thus, these findings suggests that heightened arousal alone is insufficient to increase suicidality, and support the role of acquired capabilities as highlighted by the IPTS.

Though this evidence (Hochard et al., 2015; Ribeiro, Bender, et al., 2014) indirectly provided support for the IPTS over Escape Theory, explicit testing of the interaction between sleep specific symptoms of heightened arousal and acquired capabilities has yet to be performed. Previous studies measured general arousal symptoms by combining waking state and sleep symptoms (Ribeiro, Silva, et al., 2014; Ribeiro, Bender, et al., 2014).

Due to this conflation, clarification is required to elucidate whether sleep symptoms independently interact with acquired capability to increase suicidality. Such investigation would clarify the variance explained directly attributable to the interaction between acquired capability and sleep specific symptoms (insomnia and nightmares) - this is important because it has implications for the development of intervention strategies for suicidality. Moreover, whilst Escape Theory predicts that symptoms of heightened arousal (insomnia and nightmares) should show a significant main effect in predicting increases in suicidality; the IPTS predicts that only interaction effects with acquired capability and not main effects ought to increase suicidality. Further, models directly assessing the effects of entrapment (the inability to escape) beyond the effects of IPTS constructs and the interaction effect of entrapment and heightened arousal in predicting suicidality have yet to be reported. Thus, the current study allows for the explicit testing of the IPTS-suggested interaction between sleep symptoms of heightened arousal and acquire capability, and to explore potential additive variance explained by interactions between sleep symptoms and entrapment on suicidality.

### *Aims and hypotheses*

The present study aims to assess the interaction between sleep specific symptoms of heightened arousal (insomnia and nightmares) and acquired capabilities in predicting suicidal ideation. For the purpose of the present study, we are focusing on acquired capability via engagement in self-harm (regardless of suicidal intent) as defined by Hawton et al. (2003), that is a history of self-harm, due to its strong predictive association with future suicide behavior (Brown, Beck, Steer, & Grisham, 2000; Nock et al., 2006). Further, the study will test for main effects of sleep arousal and interactions with entrapment in predicting suicidal ideation. The present study thus provides an important component association test to and will lead to better knowledge for a full theory comparison in future. Nadorff et al. (2014) report main effects of nightmares on suicidal risk and attempts to vary from significant to non-significant in one of

two samples to when controlling for depressive symptoms. Thus, depressive symptoms will be controlled for in our models to account for these potential fluctuations. Based on the existing literature we hypothesize that:

- i. Sleep symptoms of heightened arousal will show no main effect however will interact with (a) Acquired Capability and, (b) Entrapment to significantly predict increases in suicidality.

## **Methodology**

### *Design and procedure*

A cross-sectional e-survey was performed. Participants were provided with information regarding the content of the study and instructed to complete the survey in a single sitting. However, no time limit was imposed allowing participants to take their time and carefully read each question. The e-survey was composed of six scales measuring the key constructs of interest for this study. Additional demographic questions were included at the end of the survey.

### *Ethics statement*

This study received ethical approval from the study institution's ethics committee. Consent was obtained from all participants. Written debriefing information containing information of support groups for issues explored by the study were provided to all participants.

### *Participants*

To adequately power ( $1-\beta=.80$ ;  $\alpha=.95$ ) a multiple linear regression with 4 predictors (main effects and interaction) and 4 control variables (demographics and depressive symptoms) to detect a change in variance explained commensurate with an effect size of Cohen's  $F^2=.02$ , as previously reported in the literature (Ribeiro, Bender, et al., 2014; Ribeiro, Silva, et al., 2014), required 602 participants.

A total of 708 participants attempted the questionnaire. No restrictions, other than age of consent, were placed on participation. One hundred and sixty-eight participants were excluded from the analysis due to improper completion (i.e. they did not provide data on main outcome) or omission demographic information (e.g. Age, Sex). Participants included in the analysis consisted of 540 (25.7% males) individuals aged 18 to 65 years ( $M= 24.2$  years old,  $SD= 7.9$ ) recruited via an online participant pool and experiment manager. The sample identified as 18.7% in employment, 1.9% unemployed, and 79.4% as students. Participants were naïve to the aims of this study. Research credits were granted to participants in exchange for participation in the case of students, while others were entered in a lottery for a small monetary compensation.

### *Measurements*

Insomnia was measured with the 7-item *Insomnia Severity Index* (ISI; Morin, 1993) which assesses participants' subjective symptoms and the perceived impact of insomnia on daily functioning and quality of life. Higher scores are indicative of greater insomnia severity. The ISI was selected for its high validity and reliability (Bastien, Vallières, & Morin, 2001). The Cronbach's alpha of the ISI for this sample was  $\alpha= .87$ .

Nightmares were measured with the 7-item *Disturbing Dream and Nightmare Severity Index* (DDNSI; Krakow, 2006). The DDNSI measures frequency and severity of participants' disturbing dreams and nightmares with greater scores being indicative of greater severity. The scale was chosen for its brevity and ability to predict clinically salient nightmare complaints (Krakow et al., 2002). The Cronbach's alpha of the DDNSI for this sample was  $\alpha= .86$ .

The 16-item *Entrapment Scale* (Gilbert & Allan, 1998) measured inability to escape due to perceived internal and external factors. Higher scores are indicative of a greater degree of

perceived entrapment or greater inability to escape. The Cronbach's alpha for this sample was  $\alpha = .96$ .

Acquired capability for suicide was assessed with the *modified Deliberate Self-Harm Inventory* (mod-DSHI; Lundh et al., 2007). This scale is based on the DSHI (Gratz, 2001) and composed of the same 17 dichotomous (Yes/No) items relating to clinically based self-harm behaviors. However, the mod-DSHI explores lifetime self-harm history regardless of suicidal intent. Endorsement of any of the items was recorded as 1, while no self-harm history was recorded as 0. The Cronbach's alpha of the mod-DSHI for this sample was  $\alpha = .84$ .

Suicidal symptoms were measured using the 4-item *Depression Severity Index - Suicide Subscale* (DSISS; Metalsky & Joiner, 1997). Higher scores on this scale indicate elevated severity of suicidal symptoms. The DSISS has good psychometric properties (Joiner, Pfaff, & Acres, 2002; Metalsky & Joiner, 1997). The Cronbach's alpha of the DSISS for our sample was  $\alpha = .88$ .

In addition, the 21-item *Beck Depression Inventory-II* (BDI-II; Beck, Steer, & Brown, 1996) was included as a covariate to control for the impact of depressive symptoms in the current study. The BDI assesses the presence and severity of depressive symptoms over the preceding two week period. Greater scores are indicative of greater levels of depressive symptoms. The BDI-II has good reliability and validity (Beck, Steer, Ball, & Ranieri, 1996) and displayed strong internal consistency  $\alpha = .90$  in the present sample.

#### *Statistical analysis*

To test that acquired capability and sleep symptoms of heightened arousal will interact to significantly predict increases in suicidal ideation, two hierarchical linear regressions were performed. Variables were mean-centred prior to the computation of interaction terms, as recommended by Aiken and West (1991). The first model examined the interaction between

acquired capability and insomnia on suicidality beyond the effects of depressive symptoms, age, gender, and employment status. The second model examined the interaction between acquired capability and nightmares on suicidality beyond the effects of depressive symptoms, age, gender, and employment status. Demographics (age, gender, and employment status) were entered in Step 1, depressive symptoms followed in Step 2 while the main effects of each respective sleep heightened arousal symptoms (insomnia or nightmares) and acquired capability were entered at Step 3. The interaction terms of the corresponding sleep heightened arousal symptom with acquired capability was entered in the final step of the model.

To test the main effects of sleep symptoms of heightened arousal in predicting increases in suicidality while accounting for the effect of entrapment, a further two hierarchical linear regressions were conducted. Demographics were entered at Step 1 followed by depressive symptoms at Step 2. The main effects of acquired capability, entrapment, and the selected sleep symptom of heightened arousal were entered at Step 3. The interaction terms between entrapment and the corresponding sleep symptoms was entered in the final step of the model.

## **Results**

Means, standard deviations and zero-order correlations for all variables are provided in table 1. Here entrapment is reported, thus higher scores are indicative of lower perceived ability to escape.

**\*\*\*\*\*Insert Table 1 here\*\*\*\*\***

*The interaction between Acquired Capability and Sleep Symptoms of heightened arousal on Suicidality*

Table 2 displays the regression coefficient at each step for models investigating the interaction between acquired capability (AC) and sleep symptoms of heightened arousal (model 1: insomnia, model 2: nightmares) on suicidality.

\*\*\*\*\*Insert Table 2 here\*\*\*\*\*

Model 1 showing the interaction between acquired capability and insomnia on suicidality was significant and predicted a total of 39% of variance ( $R^2 = .39$ ,  $F(7, 532) = 47.94$ ,  $p < .001$ ). The main effect of insomnia was not significant ( $\beta = -0.01$ ,  $p > .05$ ). However, the interaction term (AC  $\times$  insomnia) was a significant predictor of suicidality ( $\beta = .50$ ,  $p < .001$ ) beyond the effects of depressive symptoms and accounted for a significant 2% increase in total variance explained ( $\Delta R^2 = .02$ ,  $F(1, 532) = 15.17$ ,  $p < .001$ ). Model 2 showing the interaction between AC and nightmares on suicidality was also significant and predicted a total of 38% of variance in suicidality ( $R^2 = .38$ ,  $F(7, 532) = 46.58$ ,  $p < .001$ ). Similarly to the previous model, the main effect of nightmares was not significant ( $\beta = 0.07$ ,  $p > .05$ ), although the interaction term (AC  $\times$  nightmares) significantly predicted suicidality ( $\beta = .31$ ,  $p = .015$ ) beyond the effects of depressive symptoms, and accounted for a significant 1% increase in the total variance explained ( $\Delta R^2 = .01$ ,  $F(1, 532) = 6.01$ ,  $p = .015$ ).

*The interaction between Entrapment and Sleep Symptoms of heightened arousal on Suicidality*

The regression coefficient at each step for models investigating the main effects of sleep symptoms of heightened arousal (model 3: insomnia, model 4: nightmares) and their interaction with entrapment and on suicidality are displayed in table 3.

\*\*\*\*\*Insert Table 3 about here\*\*\*\*\*

Model 3 demonstrating the main effect of insomnia and interaction between entrapment in predicting suicidality significantly predicted a total of 40% of variance ( $R^2 = .40$ ,  $F(8, 531) = 44.83$ ,  $p < .001$ ). The main effect of insomnia was not significant ( $\beta = -0.01$ ,  $p > .05$ ) in predicting suicidality when entered in the model with entrapment and acquired capability. However, the interaction term (entrapment  $\times$  insomnia) significantly predicted suicidality ( $\beta = .37$ ,  $p < .001$ ) and accounted for a significant 2% increase in the total variance explained of

model 3 ( $\Delta R^2 = .02$ ,  $F(1, 531) = 15.28$ ,  $p < .001$ ). Model 4 exploring the interaction between entrapment and nightmares significantly predicted 40% variance in suicidality ( $R^2 = .40$ ,  $F(8, 531) = 43.70$ ,  $p < .001$ ). The main effect of nightmares in predicting suicidality was not significant ( $\beta = .06$ ,  $p = .093$ ). In addition, the interaction effect (entrapment  $\times$  nightmares) was a significant predictor of suicidality ( $\beta = .19$ ,  $p < .01$ ), accounting for a significant 1% increase in the total variance explained of model 4 ( $\Delta R^2 = .01$ ,  $F(1, 531) = 6.91$ ,  $p < .01$ ). Figure 1 displays the moderating effect of AC and entrapment for models 1-4.

\*\*\*\*\*Insert Figure 1 about here\*\*\*\*\*

## Discussion

This study aimed to assess the interaction effect between AC and sleep specific symptoms of heightened arousal (insomnia and nightmares) in predicting suicidality, allowing us to establish the extent of variance explained due to these interactions. Further, the study aimed to test for potential additional variance explained by alternatives to the IPTS by modelling the effects of insomnia and nightmares on suicidality beyond that explained by AC. Our hypothesis that acquired capability would interact with both insomnia and nightmares to significantly predict suicidality was supported. Moreover, our prediction that sleep symptoms of heightened arousal would fail to display main effects, yet would interact with entrapment to predict suicidality was supported. Importantly, both models 3 and 4 indicated that sleep symptoms of heightened arousal were non-significant main effect predictors of suicidality when modelled with entrapment. These findings demonstrate that sleep specific symptoms of heightened arousal alone, while distressing, are insufficient to increase suicidality, and require the addition of acquired capability to engage in suicidal ideation (models 1 and 2) or must interact with a perception of entrapment (models 3 and 4). That is, the distress from the

increased arousal (sleep symptoms) must be combined with AC or the perceived inescapability of said distress in order to increase suicidality. This provides further indirect support for the IPTS over Escape theory, much as in several recent studies (Hochard et al., 2015; Ribeiro, Silva, et al., 2014; Ribeiro, Bender, et al., 2014). However, it is important to note that entrapment remained a significant predictor in our models, providing further support for this variable as a predictor of suicidality (O'Connor, 2003; Rasmussen et al., 2010).

Studies which had previously demonstrated the interaction between acquired capability and heightened arousal using measurement tools composed a mix of waking and sleeping symptoms reported the interaction effect to yield an increase in variance explained of 2% (Ribeiro, Silva, et al., 2014). Using sleep specific measures, this study obtained comparable levels of variance explained for discreet sleep disturbances, insomnia ( $R^2 = .02$ ) and nightmares ( $R^2 = .01$ ). Such variance explained equates to a Cohen's  $d$  of between .3 and .2 (a small effect size; Cohen, 1988). Considering the sizes of the effects obtained from the interactions terms (acquired capability  $\times$  sleep specific symptoms of heightened arousal), arousal impairing sleep appears to be of considerable importance. However, our findings do not allow the direct inference of which type of arousal symptoms, waking state or sleep, provides the greatest predictive value when interacting with acquired capability. They merely highlight the importance of sleep symptoms in an interaction with acquired capability when measured with purposefully designed psychometric instruments. Waking state arousal symptoms are demonstrably important proximal predictors of suicidal behaviour (Benazzi et al., 2004; Busch et al., 2003). Though, the use of measures conflating waking state and sleep symptoms of arousal may obscure the true impact of disturbed sleep on suicidality in individuals with acquired capability. In light of the current state of knowledge, it is important for clinicians to attend to all overt symptoms of arousal, be they waking state or sleep specific to maximise detection of individuals in high-risk states. Considering the unique variance explained by these

interactions (acquired capability  $\times$  sleep symptoms of heightened arousal) in predicting suicidality, we support recommendations of Bernert and Nadorff (2015) for robust and reliable measurement of sleep specific symptoms such as insomnia and nightmares. It should be noted that acquired capability in the present study focused on acquired capability through personal experience (i.e. self-harm regardless of intent). As acquired capability is conceptualised to include exposure to the pain and injuries of others (Joiner, 2009), generalization of our findings to strict definitions of acquired capability should be done tentatively. Further, while we focused on interactions between acquired capability and sleep symptoms of heightened arousal, other variables of the IPTS; burdensomeness and belongingness, should be considered. Nadorff et al. (2014) report nightmares to be independent of the IPTS. Results for insomnia remain ambiguous. However, research on the potential interactions between sleep symptoms of arousal and burdensomeness or belongingness has yet to be undertaken. Further research clarifying the differing impact of waking and sleeping arousal symptoms when interacting with acquired capability (via both self-harm regardless of intent and exposure to the pain or injury of others) or other IPTS variables is recommended.

The cross-sectional design of this study does not allow us to infer causality regarding the occurrence of arousal symptoms in relation to suicidality. Prior research has attempted to provide some indications of the directionality of effect between nightmares and increased suicidality (Hochard et al., 2015), though the evidence is tentative at best. Further studies employing longitudinal or experimental designs are recommended to shed light on this issue. Further, the generalizability of our results is limited by the sample composed predominantly of female students (75% female). This homogeneous sample is known to be prone to sleep difficulties (Gellis, Park, Stotsky, & Taylor, 2014) or shift work which could contribute to the reported effects. Nonetheless, the interactions reported replicate those found in a military sample (Ribeiro, Bender, et al., 2014) composed overwhelmingly of males and in an outpatient

(59% female) sample (Ribeiro, Silva, et al., 2014). Considering our findings and those of reported in the literature, it appears that the interactions between arousal and acquired capability are not gender specific.

*Implications and conclusion*

Empirical evidence from cross-sectional and longitudinal studies (Ribeiro et al., 2012) show that single item measures of arousal such as sleeplessness can outperform robust predictors of suicidality such as depressive symptoms and hopelessness. This evidence emanated from a sample of predominantly young adult males in the military, making generalisation of findings difficult. However, our results and those reported by Ribeiro and colleagues indicate somatic sleep symptom of arousal can be an important predictive factor. This is all the more relevant in cultures where suicidal behaviour is deemed taboo due to stigma associated with mental health issues but help seeking for somatic symptoms such as sleep troubles may be deemed more acceptable.

Though not a direct contrast of these two theories, our findings provide further indirect support for the IPTS over Escape theory by showing a lack of main effects for sleep arousal symptoms. A robust contrast of both theoretical models, in explaining the impact of sleep arousal on suicidality, measuring all components of the theories, is suggested as a beneficial next step to further our understanding. The overt nature of heightened sleep arousal may therefore be beneficial in identifying those most at risk, particularly if acquired capability (e.g. a history of self-harm) is known to the clinician. These observable and more readily communicable symptoms would allow for appropriate assessment and interventions efforts to be mobilized. Psychological treatments for insomnia such as CBT-I have shown good effectiveness (Koffel, Koffel, & Gehrman, 2015; Okajima, Komada, & Inoue, 2011), as have nightmare treatments such as IRT (Casement & Swanson, 2012) though further controlled trials

are suggested (Harb et al., 2013). While, pharmacological options for insomnia (Buscemi et al., 2007) and nightmares (Kung, Espinel, & Lapid, 2012) have been identified, caution is advised due to the toxicity of some medications such as benzodiazepine (Buckley, Dawson, Whyte, & O'Connell, 1995) and their potential to be used in self-poisoning (Hawton et al., 2007).

While demonstrably effective, such treatment options create a dilemma. An individual's acquired capability - having engaged in self-harm - cannot be addressed through such treatment options. Studies have shown that any instance of self-harm over the life-time increases subsequent risk of further fatal (Bergen et al., 2012) and non-fatal (Hawton et al., 2012) self-harm. Thus, while treating arousal symptoms is likely to be highly beneficial in safeguarding individuals at risk in the short to medium term, increased vulnerability will remain. Long-term management by increasing an individual's ability of coping with distress (including heightened arousal) would therefore be necessary for long term wellbeing and reduced suicidal risk. Third wave therapies such as Acceptance and Commitment Therapy (Hayes, Strosahl, & Wilson, 1999) have demonstrated promising results (Ruiz, 2010) in increasing distress tolerance. Others 3<sup>rd</sup> wave therapies such as Mindfulness-Based Cognitive Therapy (Williams et al., 2014), Mentalization-Based Therapy (Rossouw & Fonagy, 2012), and Dialectic Behavioural Therapy (Chapman, 2006) have also shown positive effects. Approaches which focus on building metacognitive skills should be considered for long-term management of individuals identified to be at increased vulnerability.

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Table 1 – Descriptive statistics and zero order correlations for study variables.

	1	2	3	4	5	6	7	8
1. Insomnia (ISI)	-							
2. Nightmares (DDNSI)	0.42**	-						
3. Acquired Capability (self-harm history)	0.20**	0.22**	-					
4. Depressive Symptoms (BDI-II)	0.59**	0.41**	0.36**	-				
5. Entrapment	0.46**	0.32**	0.28**	0.78**	-			
6. Suicidality (DSISS)	0.33**	0.29**	0.35**	0.58**	0.54**	-		
7. Age	0.03	-0.08	-0.08	-0.06	-0.02	-0.08	-	
8. Gender	-0.04	0.15**	0.06	0.01	-0.07	-0.10*	-0.07	-
9. Employment Status	-0.05	-0.12**	-0.13**	-0.12**	-0.03	-0.10*	-0.06	0.61**
Mean	8.58	6.61	0.40	14.57	15.03	0.80	24.16	-
S.D.	5.49	5.79	0.49	10.61	15.18	1.69	7.92	-

\* $p < .05$ , \*\* $p < .01$

*Table 2 – Hierarchical linear regression models predicting suicidality from the interaction between acquired capability (AC) and sleep symptoms of heightened arousal beyond depression.*

Model	Variable	$\beta$	$t$	$p$
<i>1. Insomnia</i>				
Step 1 ( $R^2 = .02, p < .01$ )	Gender	-0.10	-2.40	<.05
	Age	-0.03	-0.64	>.05
	Employment status	-0.81	-1.51	>.05
Step 2 ( $\Delta R^2 = .32, p < .001$ )	Depressive symptoms	0.57	16.26	<.001
Step 3 ( $\Delta R^2 = .03, p < .001$ )	AC	0.17	4.61	<.001
	Insomnia	-0.01	-0.21	>.05
Step 4 ( $\Delta R^2 = .02, p < .001$ )	AC X Insomnia	0.50	3.90	<.001
<i>2. Nightmares</i>				
Step 1 ( $R^2 = .02, p < .01$ )	Gender	-0.10	-2.40	<.05
	Age	-0.03	-0.64	>.05
	Employment status	-0.81	-1.51	>.05
Step 2 ( $\Delta R^2 = .32, p < .001$ )	Depressive symptoms	0.57	16.26	<.001
Step 3 ( $\Delta R^2 = .03, p < .001$ )	AC	0.17	4.48	<.001
	Nightmares	0.07	1.77	>.05
Step 4 ( $\Delta R^2 = .01, p < .05$ )	AC X Nightmares	0.31	2.45	<.05

*Table 3 – Hierarchical linear regression models predicting suicidality from the interaction between entrapment and sleep symptoms of heightened arousal beyond depression*

Model	Variable	$\beta$	$t$	$p$
<i>1. Insomnia</i>				
Step 1 ( $R^2 = .02, p < .01$ )	Gender	-0.10	-2.40	<.05
	Age	-0.03	-0.64	>.05
	Employment status	-0.08	-1.51	>.05
Step 2 ( $\Delta R^2 = .32, p < .001$ )	Depressive symptoms	0.57	16.26	<.001
Step 3 ( $\Delta R^2 = .03, p < .001$ )	AC	0.17	4.61	<.001
	Entrapment	0.21	3.80	<.001
	Insomnia	-0.01	-0.23	>.05
Step 4 ( $\Delta R^2 = .02, p < .001$ )	Entrapment X Insomnia	0.37	3.91	<.001
<i>2. Nightmares</i>				
Step 1 ( $R^2 = .02, p < .01$ )	Gender	-0.10	-2.40	<.05
	Age	-0.03	-0.64	>.05
	Employment status	-0.81	-1.51	>.05
Step 2 ( $\Delta R^2 = .32, p < .001$ )	Depressive symptoms	0.57	16.26	<.001
Step 3 ( $\Delta R^2 = .05, p < .001$ )	AC	0.16	4.45	<.001
	Entrapment	0.21	3.76	<.001
	Nightmares	0.06	1.69	>.05
Step 4 ( $\Delta R^2 = .01, p < .01$ )	Entrapment X Nightmares	0.19	2.63	<.01