Mindfulness As Predictor of Accidents, and Sex as their Moderator in the Healthcare Professionals

Prahalad Adhikari[1*]
Tri-Chandra College, Kathmandu
*Correspondence: prahalad.adhikari@xavier.edu.np
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Abstract

Mindfulness is the ability to be aware of the present moment and accept the sensations, feelings, and thoughts that come up. It is an indicator of adaptability according to the inadaptability theory of accident causation and is supposed to reduce accidents. A survey method was adopted as data collection technique to make a convenience sample of 248 healthcare professionals in Nepal. A validated psychological test was used to measure mindfulness and a six-item test was made for participants to self-report the errors and accidents they did or were a part of in the last 12 or one month(s). The mindfulness did not predict the accidents, in contradiction to the prediction of the theory taken as framework. In simple models, sex moderated the relationship between mindfulness and errors/accidents. When covariates were considered in models, it did not moderate the relationship. Weekly travelled distance was the predictor of accidents most of the time. The limitations and suggestions for future research have been presented.
Keywords*: errors, medical employees, doctors, nurses, pharmacists, inadaptability*

Introduction

Mindfulness is being present at the moment and paying attention in a non-judgmental manner (Spitzmueller et al., 2020). It can also be called 'presence of mind'. It also means staying aware or paying close attention to something. At workplace, mindfulness refers to the conscious awareness that might affect health and safety (Safe Work Australia, 2015). Being mindful has many advantages like being able to prevent cognitive bias or being able to observe events or things objectively, think objectively, and decide objectively. Mindfulness is a lifestyle guided by Buddhist school of philosophy also as one among eight paths to get relief from miseries, but Buddha suggests to do it *correctly*. Being more mindful could be a factor to contribute to adaptability and hence may lead to workplace safety. Being less mindful (or more distracted) could be a contributing factor to inadaptability and hence to errors/accidents at workplace. Distraction is the opposite of mindfulness. It has been associated with high rate of errors and accidents. It is a factor to increase errors, near misses and accidents according to the inadaptability theory of accident (Adhikari, 2017). In other words, a prediction of this theory is that being less mindful (related to increased inadaptability) should be associated with more errors/accidents.

Figure 1. Inadaptability can be operationalized by the concept of low mindfulness (as an indicator) and this should be able to predict errors/accidents

Experts speculated the positive effect of mindfulness at workplace safety like affective regulation and reducing accidents (Glomb et al., 2011). The inquiries have gradually shown that mindfulness is useful to increase safety and reduce accidents. More mindful people follow safety guidelines more and detect risk cues in the working environment. Less mindful people "tend to commit errors and be involved in more accidents and injuries at work" (Spitzmueller et al., 2020). Even a new concept of "safety mindfulness" has been presented. It has things like preoccupation with success/failure, not simplifying of interpretations, sensitivity to operations and commitment to resilience in addition to regard for expertise (McDonald et al., 2015). Organizational practices and processes can be used to enhance collective mindfulness and hence to reduce errors (Weick et al., 1999).

Dispositional mindfulness was associated with safety compliance and participation behaviors among nuclear power plant workers (Zhang & Wu, 2014). It is the dispositional tendency to be mindful.

Mindfulness-based intervention can increase patient and staff safety (Hallman et al., 2014; Mumber, 2014). Repeat traffic offenders lessened accidents after mindfulness-based intervention (Baltruschat et al., 2021). The components of mindfulness- acting with awareness, non-judging

of inner experience, and non-reactivity to inner experience, were significantly related to experiences of near accidents (while talking or texting) among young drivers (Terry & Terry, 2015). A brief mindfulness-based intervention can improve attention during a team work (Kang et al., 2021). Not only in practice, but also during training in school, if the medical students could be taught mindfulness, they also would do less errors and accidents (Hassed, 2021; Spitzmueller et al., 2020).

The following figure is the conceptual framework for the research. This study tests the model in which sex is the moderator in the relationship between mindfulness and errors/accidents. The literature review concluded that such a model has not been tested yet.

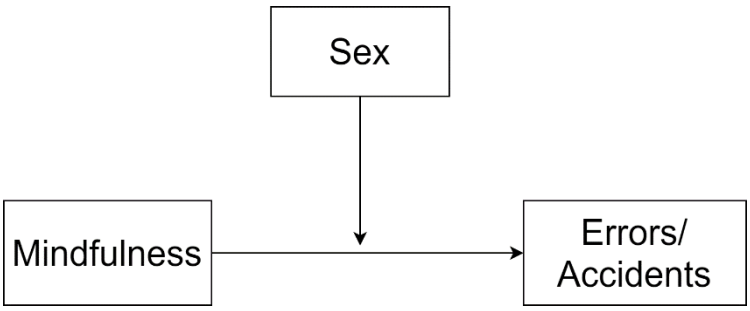

Figure 2. Conceptual diagram of the moderation model

Method

Sample

An a priori power analysis using G*Power 3.1.9.7 (Faul et al., 2007) for linear multiple regression (fixed model, R^2 increase) with 13 predictors (including demographic variables as covariates) calculated 248 persons are required to provide an appropriate level of statistical reliability (power .95, small to medium effect size 0.05, error probability 0.05). A total of 250 participants were taken as the members in a convenient sample of this study but two data were eliminated because related participants had not completed Mindful Awareness Attention Scale.

Instruments

Mindful Awareness Attention Scale (MAAS) by Brown & Ryan (2003) was used to measure dispositional mindfulness. It has 15 items with 6-point Likert Scale. In it, 1 means 'almost always' and 6 means 'almost never'. Since the items are worded in a manner meaning 'no mindfulness', the meaning of Likert rating in opposite direction makes it positive. That means, higher the score, higher the dispositional mindfulness.

Accident history scale (AHS) was created with six questions to assess the number of errors and accidents people encountered at their workplace (including commuting). Six questions were asked to assess the number of errors and accidents a participant was a part of.

Table 1

Items of Accident History Scale (AHS)

AHS1 How many accidents were you a part of in the last one year?
AHS2 In the last one year, how many accidents occurred because of you?
AHS3 In the last one year, how many accidents were you a part of, caused because of factors other than you?
AHS4 How many errors did you commit while performing tasks at your workplace in last one month?
AHS5 How many accidents have occurred with you because of weakness of management or poor system at your workplace?
AHS6 How many accidents occurred because of your own weaknesses in last one year at your workplace?

In both the scales, items were presented to participants in English and Nepali languages both.

Data collection

Five trained assistants collected data from 12 health institutions of Kathmandu. The survey questionnaire was administered in-person, and data were collected. The assistants entered the data into Excel.

Data analysis

The data were imported from Excel to SPSS and Process Macro was used to test the moderation models. A hierarchical regression analysis was also conducted.

Results

The Accident History Scale (AHS) had the Cronbach's Alpha of .85. Omega Macro (in SPSS) was used to calculate McDonald's Omega (Maximum Likelihood) (Hayes & Coutts, 2020) and it turned out to be .87 for AHS. The

descriptive statistics related to AHS items are given below in the table:

Table 2

Descriptive statistics for errors/accidents and mindfulness

	Minimum	**Maximum**	**Mean**	**SD**	**W**	**p value**
AHS1	0	26	2.54	3.755	.717	.000
AHS2	0	10	1.34	1.969	.726	.000
AHS3	0	20	1.54	2.514	.654	.000
AHS4	0	9	1.58	1.939	.802	.000
AHS5	0	10	1.33	2.138	.683	.000
AHS6	0	12	1.29	2.258	.633	.000
MAAS Score	16	90	66.27	16.604	.909	.000

Note: W is the Shapiro-Wilk Statistic and p value is its related significance value.

The table 2 also shows the mean and standard deviation of MAAS score (i.e., mindfulness). The 25^{th}, 50^{th} and 75^{th} percentiles are 58.25, 70.00, and 78.00 respectively. The Cronbach's Alpha for MAAS was .93 and McDonald's Omega (Maximum Likelihood) was also .93. The normality check of mindfulness scores showed it to be non-normal. Shapiro-Wilk Test showed mindfulness score distribution to be non-normal, accidents (AHS1, AHS2, and AHS3). W(247) = .909, p<.0.001. So, the non-parametric tests were applied to test the hypotheses. Mann-Whitney U test showed that there is significant difference in mindfulness score between males and females. Females are more mindful than males. The results show that they commit more accidents also in average. Significant difference is not seen in errors and two categories of accidents (AHS5 and AHS6). Statistically significant difference between males and females was seen in three categories of

Table 3

Significant difference of means of mindfulness and errors/accidents based on sex

	AHS1	AHS2	AHS3	AHS4	AHS5	AHS6	Mindfulness
Mann-Whitney U	2801.000	3013.500	3120.000	4214.500	4351.500	4131.500	3449.500
p value	0.000	0.000	0.000	0.123	0.193	0.074	0.002
Female mean	3.06	1.60	1.81	1.63	1.42	1.43	67.73
Female SD	4.008	2.098	2.701	1.915	2.193	2.419	16.293
Male mean	0.43	0.29	0.43	1.39	0.98	0.71	60.35
Male SD	0.791	0.612	0.935	2.039	1.876	1.307	16.704

Without controlling other variables, sex moderated the mindfulness-errors/accidents relationship. The six models have been summarized in the table below.

Table 4

Summary of moderation models with interaction predictor: mindfulness x sex

Dependent	B	SE	95% CI	R^2	R^2 change	F
AH1	-.0612	.0122	[-.09, -.04]	.1261	.0115	25.13
AH2	-.0258	.0082	[-.04, -.01]	.0913	.0074	9.84
AH3	-.0468	.0106	[-.07, -.02]	.0984	.0150	19.67
AH4	-.0697	.0200	[-.10, -.03]	.0776	.0559	12.12
AH5	-.0476	.0142	[-.08, -.01]	.0843	.0214	11.17
AH6	-.0566	.0137	[-.08, -.03]	.0703	.0273	17.04

These moderation models have been graphically illustrated in figure 3:

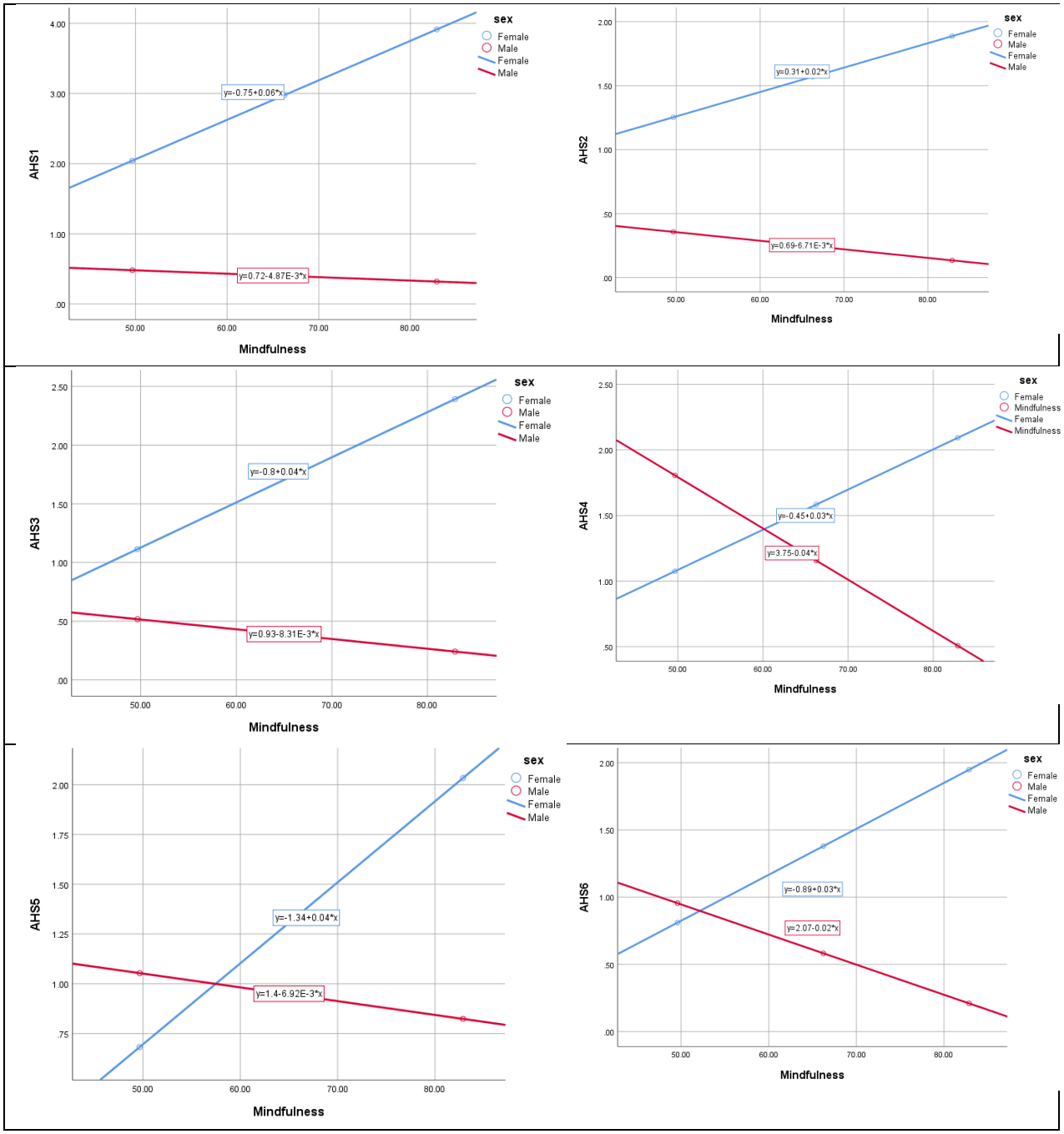

Figure 3. Visual representation of six moderation models

The following table 5 shows that mindfulness was significantly associated with accidents/errors. Except for a category of accidents, the association is in direction opposite to the prediction of the inadaptability theory of accident causation. In terms of partial correlation, significant association was not seen even though direction of association is seen as predicted by the theory for three categories of accidents.

Table 5
Relationship between errors/accidents and mindfulness

	Sex	AHS1	AHS2	AHS3	AHS4	AHS5	AHS6	Mindfulness
Sex		-.069	-.048	-.027	-.018	.029	.113	-.160*
AHS1	-.280**		.786**	.551**	.523**	.259**	.298**	-.023
AHS2	-.266**	.764**		.330**	.438**	.165*	.376**	-.115
AHS3	-.219**	.648**	.517**		.474**	.440**	.320**	.052
AHS4	-.049	.468**	.416**	.531**		.614**	.515**	.037
AHS5	-.082	.415**	.314**	.554**	.637**		.478**	.067
AHS6	-.127*	.490**	.462**	.477**	.503**	.655**		-.102
Mindfulness	-.177**	.238**	.160*	.224**	.145*	.248**	.184**	

Note: The coefficients above the diagonal are partial correlations with the control variables: age, profession & monthly income, vehicle ownership, ethnicity, religion, vegetarianism, education, daily work hours & weekly travel (in km), and below the diagonal are bivariate correlations. The symbol * means significant at .05 and ** means significant at .01 level of significance.

After including the controls/covariates, none of the models of moderation had the significant interaction terms. It means that with the controls, the sex of medical professionals did not contextualize the mindfulness and errors/accidents relationship. In the first model (AHS1), weekly travel t=3.77, p=.0002 and age t=2.82, p=.0053 were the significant predictors. In the second model (AHS2), weekly travel, t=4.05, p=.0001 and vegetarianism, t=2.69, p=.0079 were significant predictors. In the third model (AHS3), vehicle ownership t=2.04, p=.0433 and weekly travel, t= 2.04, p=.0428 were significant predictors. In the fourth model (AHS4), no variables predicted significantly. In the fifth model (AHS5), the significant predictors were monthly income, t=-2.62, p=.0095, and owning vehicle, t=2.22, p=.0279. In the sixth model (AHS6), the significant predictors were weekly travel, t=2.45, p=.0155, and vegetarianism, t=3.12, p=.0021.

Table 6
Variance explanation in the six models with covariates

Dependent	R^2	Interaction coeff.	MAAS coeff.	Sex coeff.
AHS1	.3226	.0486	-.0273	-4.1788
AHS2	.2848	.0427	-.0356*	-3.3055
ASH3	.1756	-.0132	.0155	.6680
ASH4	.072	-.0224	.0136	1.4397
AHS5	.1479	-.0160	.0175	1.3859
AHS6	.2096	-.0135	-.0066	1.4608

Note: The symbol * means the value is related to a significant t statistic at .05 level. Coeff. means coefficient.

The hierarchical regression analysis revealed that mindfulness was not a predictor of errors/accidents. All covariates explained 31.3% variance for AH1, 26% variance for AH2, 17.2% variance for AH3, 6.7% variance for AH4, 14.1% variance for AH5, 19.2% variance for AH6 but independent and moderator variable made no remarkable difference in the model after they were added into it in steps. For AH6, there was 8 and 8 percent increase in variance in each step but without significance.

Discussion

Looking at the pattern of females in simpler models, we can conclude that more mindfulness may not be helpful to reduce errors/accidents. The pattern in males suggests the opposite. The more the mindfulness, the lesser the errors/accidents are. In the models with covariates, sex did not contextualize the relationship between mindfulness and errors/accidents. Still, errors/accidents were mostly predicted for higher

weekly travel. Other predictors in some cases were vegetarianism, owning vehicle, age, and monthly income.

The conclusion is that mindfulness does not predict errors/accidents. In simple relationships, sex moderates the relationship between mindfulness and errors/accidents but confounding variables disturb this relationship and sex cannot contextualize it.

Limitations

Both the mindfulness and accidents have been self-reported. The participants also filled the survey in a hurry. So, the objective data might not have been portrayed by the survey process because of flaws in memory and other biases like impression management. To overcome the limitation, data stored by organization about errors/accidents of employees would be more accurate.

Future research

The role of mindfulness as the protective factor than an independent variable (or risk factor) is more favorable for future research. It could be explored as moderator in the relationship of personality and accidents, perceived safety condition in workplace and accidents, and so on . The protective effect of mindfulness can be inquired outside the healthcare practice also like in relationship between perceived road condition and accidents in private vehicle owners.

If not directly, the mindfulness may mediate/mitigate anger and aggression, and then reduce accidents or errors. Such research can be conducted in the future. Among cyclists, mindfulness was associated with less frequent aggressive behaviors (Stephens et al., 2020). Factors like distraction, anger, and aggression (or the factors to increase inadaptability) can be reduced by mindfulness and errors/accidents can be minimized.

Some indicators of empirical validity of the inadaptability theory of accident causation are seen but the self-report/impression management/memory biases might have affected the data. So, more objective ways to verify the prediction is warranted. This study shows that survey method (and particularly letting people remember errors/accidents over a period of time) may not be suitable to collect data about accidents. An alternative would be to collect organizational data. The organization can have the practice of recording errors/accidents committed by each employee.

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