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Construction and Validation of Nature Contact Scale for Adults of Khyber Pakhtunkhwa

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ABSTRACT

Human beings have an innate tendency to feel attachment with plants, animals and other natural things which are necessary for the sustainability of life on earth. Human beings show their love for life by Nature Contact through different nature based activities like gardening/horticulture, Animal/bird care, visiting nature resorts or by General Nature Contact. In the realm of Eco-psychology current research focused on the development of an indigenous scale, which could be used to explore the degree of Nature Contact prevailing among the adults of Khyber Pakhtunkhwa. In order to fulfill this purpose, a data of N=200 was obtained from adults, living close to nature ranging in age from 18 to 65years. Exploratory factor analysis of the data, showed presence of four factors namely Gardening (GAR), Contact with Friendly Animals and Birds (CFAB), Trip to Nature's Resort (TNR) and General Nature Contact (GNC) in the Nature Contact Scale (NCS). A data of N=200 was again obtained from another sample fulfilling the same criteria, for confirmatory factor analysis, which confirmed the presence of already explored and proposed factors in the scale. Composite reliability and construct validity of the scale were also quite satisfactory, as determined through AMOS, Validity Plugins. These results proved that Nature Contact scale was a valid and reliable instrument to measure degree of Nature Contact prevailing among the adults of Khyber Pakhtunkhwa.

1. INTRODUCTION

Nature refers to the phenomena of the physical world collectively, including plants, animals, the landscape, and other features and products of the earth, as opposed to humans or human creations (Cambridge Dictionary, 2019).According to biophilia hypothesis humans have a genetic tendency to make connections with nature and other forms of life. The term Biophilia was used by German-born American psychoanalyst Erich Fromm in, The Anatomy of Human Destructiveness (1973), which described Biophilia as "the passionate love of life and of all that is alive." The term was later used by American biologist Edward O. Wilson in his work Biophilia (1993), which proposed that humans love for nature and life has, in part, a genetic basis. Human beings show their love for life by nature contact through different nature based activities like gardening/horticulture, animal/bird care, visiting nature resorts or by general nature contact. Past research showed that this contact with natural environment can promote mental health and well-being (Chalquist, 2009).

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Literatu

A liking for nature can be seen in the conduct of most societies, both historical and contemporary. For instance, in the paintings found in the Pompeii ruins it was discovered that people grew plants into their homes and gardens (Manakar, 1996). Furthermore, in urban areas too, we can see plants and trees on the road sides grown for the beautification the surroundings. An inclination towards adding nature elements to our surroundings is a tendency of all humans. This is obvious that if artificial surroundings pull people away from nature, every person being affluent will try to counteract these effects. Such a conduct is most likely a reaction to the human mind's biophilic nature (Kellert, 2005). Infirmaries were Europe's original type of hospital where garden was the necessary part of the hospital (Gerlach et al., 1988).

Since then, the link between greenery and either preventive or therapeutic medicine has gradually faded. The reason for this decline is in part due to progress in medical science or other technological ways of treatment. The effects of being in nature and growing plants in otherwise sterile environments remained a topic of research for the past few decades. The findings of these studies have demonstrated that people who feel more connected to nature tend to feel more positive affect, vitality, and life satisfaction than people who don't feel as connected to nature (Capaldi, Dopko & Zelenski, 2014). A rising number of mental health charities, including Mind, promote nature-based treatments as an extra or alternative kind of treatment for a variety of mental health conditions and in promoting mental health in general (Peacock, Hine, &Pretty, 2007).

Theoretical Framework

Theodore Roszak discovered Eco-Therapy, often known as nature therapy or green therapy, which is a newly recognized field within Eco-Psychology. By working with plants, animals, and natural landscapes, the profession of nature-based therapy aims to harness the healing power of the natural world. According to the study's objectives, NBT is often separated into four categories: (1) horticulture therapy, (2) animal assisted therapy, and (3) natural environment therapy. Additionally, nature tourism/adventure therapy is included in this category. As a result, the common types covered in the current literature are four. It also featured other types, such as group conservation activities and outdoor meditation, but these types actually overlap with the other four. Thus the common types incorporated in the present study are four. Whereas traditional treatments have frequently had only patchy results, these kinds of care have shown to be successful.

Horticulture therapy

Using plants as a tool for psychotherapy is known as horticultural therapy (Frumkin et al., 2017). Participation in horticulture activities led by a qualified therapist with the aim of achieving well-defined and recorded therapeutic objectives—A method by which individuals work to enhance their quality of life by actively or passively interacting with plants and activities linked to them. Horticulture therapy is the practice of cultivating and tending to plants with the intention of enhancing one's health or treating various mental health issues.

Animal Assisted Therapy

Using pets and animals as a help during psychotherapy in a therapeutic context is known as animal-assisted therapy (Knisely et al., 2012). The beneficial interaction between people and animals was covered in the literature as early as the late 17th century. John Locke recommended small animals to foster nurturing and a sense of responsibility for others in 1699. Animals were utilized to help mentally ill people connect socially in the late 1700s. Pets were frequently seen as friends by patients in long-term care facilities and mental health facilities during the 1800s.

Adventure Therapy

Adventure therapy involves using adventure activities that mental health professionals deliver, usually in a natural setting. The encounters are intended to engage participants on a mental, emotional, behavioral, and physical level. Adventure therapy can be broadly classified into three types: wilderness treatment, adventure-based therapy, and long-term residential camping. Although the goals of these three different groups may differ substantially in terms of order (Gass et al., 2012), they are all the same.

Natural Environment Therapy

General natural contact is the setting for this kind of therapy. The six steps of a nature-based treatment process are: stimulation, acceptance, purification, insight, recharging, and change, it was found. Oh and colleagues (2020) found that patients who had received nature-based therapy experienced varying degrees of healing over time. According to Wang et al. (2019), having access to green space is linked to improved overall health, mental development in children, and decreased psychological distress in teenagers. Studies have demonstrated the superiority of natural settings over built ones in fostering a comprehensive sense of interconnectedness with all living forms (Passmore & Holder, 2016). Nature walks help those who are depressed. Research has indicated that patients' moods are much lifted when they are in natural environments. They also felt more motivated and encouraged to heal and get back to their normal selves (Berman et al., 2012).

Conceptual Framework

The items on the Nature Contact Scale will therefore be based on the following four categories of Nature Contact, taking into consideration the therapeutic benefits of all of the strategies mentioned above.

- Whether at home, at work, or somewhere else, routine interactions with the natural environment, such as greenery, plants, birds, animals, flowers, water, soil, sunlight, etc.
- Outdoor pursuits such as agriculture/horticulture/gardening.
- Outdoor recreation in nature-themed parks and resorts, such as hiking, boating, fishing, camping, horseback riding, and swing-using.
- Caring for or spending time with animals that are friendly, such as pets or birds.

Rationale of the Study

In order to study the role of different nature based activities in improving mental health as well as to find out its effects on personality, cognition and attention etc, it is not always easy to perform experimental studies which provide short term effects of any variable or phenomenon. Therefore keeping in view the importance of nature contact for humans and the need for exploring the therapeutic benefits of Nature Based activities, it was considered more desirable to develop an indigenous scale for the adults of Khyber Pakhtunkhwa, which could provide the degree of nature contact in this population. The Scale could be used by other researchers to study the effects of Nature Contact on human beings in various life domains.

Objectives

- To construct a valid and reliable instrument to measure the degree of Nature Contact in the adult population of Khyber Pakhtunkhwa.
- To confirm the presence of four factors i.e Gardening(GAR), Contact with Friendly Animals and Birds (CFAB), Trip to Nature's Resort (TNR) and General Nature Contact (GNC) in the Nature Contact Scale (NCS).

Hypotheses

- Nature Contact Scale will be a valid and reliable instrument to measure the degree of Nature Contact in the adults of Khyber Pakhtunkhwa.
- Nature Contact Scale will consist of factors i.e Gardening (GAR), Contact with Friendly Animals and Birds (CFAB), Trip to Nature's Resort (TNR) and General Nature Contact (GNC).

2. METHODOLOGY

This study was conducted in the following 4 steps.

Literature Review and Item Generation

Initially, 85 items three times more than required, were developed by having discussions with people fulfilling the criteria of nature contact. Further help was taken from any available books/journals and tests in the area of nature contact.

Qualitative Item Analysis and Preliminary Try Out

Sample

A group comprising 10-15 people from the general population including agriculturists, gardeners, tourists and those having general nature contact in their everyday life were contacted for content validation of the initial pool of 85 items. 3 experts in the field of test construction were also contacted for the psychometric evaluation of the pool.

Procedure

The item pool was discussed with experts for their suggestions on content validity, and use of grammar. Only those items were retained in the first draft on which experts had 60-70% consensus. All unnecessary the low rated items by experts were thus deleted from the list or recommended for modification. After the removal and modification of some items, 45 items were kept and used in a small pilot study on a group of 10 gardeners, 10 pet keepers, 10 tourists and 20 adults who regularly interact with nature. Appropriate instructions were given and consent was obtained from them. Items with activities that were gender-specific, difficult for respondents to comprehend or received no responses at all were eliminated. In the end, 36 items were kept to create the scale's initial draft.

Tryout of the First Draft

Sample

A sample of (N=215) men and women, aged 18 to 65, with at least a primary education, was chosen from all those regions of the Khyber Pakhtunekhwa with a high concentration of green spaces. The sample was chosen using a purposive sampling technique.

Inclusion/Exclusion Criteria

The sample was regularly exposed to the elements of nature, such as sunlight, water, soil, vegetation, birds, and animals. Those who visited parks or nature resorts at least once a month or engaged in some horticultural activities in a proper garden or farmland as part of their daily routine were included in this sample. In a similar vein, information was gathered from adults who interacted with friendly birds or animals. The study excluded adults with established mental illnesses and those with sensitivities to any plants or animals. The study also eliminated those who had come into contact with any dangerous animals, such as stray dogs or snakes.

Procedure

A short screening Interview, consisting of 10 questions was conducted with people from multiple cities of the province. They were contacted at schools colleges, universities or their homes. A sample of 200 adults, meeting the criteria of nature contact were therefore chosen for the study. A set of 36 items, obtained from the pilot study, were administered on this sample. The sample was given proper instructions for giving responses on a Five-Point Likert Scale. Individual administration of the first draft was done. Exploratory factor analysis and item total correlation was performed to select items showing better factor loadings. Items showing low item-total correlations and poor factor loadings were excluded.

Final Tryout

A new sample of (N=200), males and females in the age range of 18-65, with a minimum qualification of primary school was selected. The sample met the same criteria of nature contact as explained before. 27 items selected from the first tryout were administered again on the new sample. Confirmatory Factor analyses were conducted to confirm the presence of already explored factors in the scale. Composite reliability and validity of the final scale were also determined using AMOS.

3. RESULTS

Table 1
Demographic characteristics of the Sample (N=215) for the Exploratory Factor Analysis of the first draft of Nature Contact Scale (NCS)

Variable	N	%
Gender		
Male	98	45.6
Female	117	54.4
Age		
18-65	215	100
Marital Status		
Married	144	67
Unmarried	71	33
Education		
Primary	2	.9
Matric	11	5.1
Intermediate	120	55.8
Bechlor/Master	63	29.3
Higher Education	19	8.8
Profession		
Nil	145	67.4
Govt/Private job	62	28.8
Bussiness	4	1.9
Agriculture	4	1.9
Socioeconomic Status		
Upper class	11	5.1
Middle class	201	93.5
Lower class	3	1.4
Residence		
Urban	100	46.5
Rural	74	34.4
Hilly areas(Urban/rural)	41	19.1

Table 2
Exploratory factor analysis for the 1st draft of NCS (Items=36, N=215)

S No.		Factor Loadings			
	Item No.	GAR	CFAB	TNR	GNC
1	NCS1	.835	.042	.075	.123
2	NCS2	.196	.151	-.178	.513
3	NCS3	.752	.003	.067	.147
4	NCS4	.325	.179	-.044	.526
5	NCS5	.289	.065	.234	.432
6	NCS6	.253	.613	.110	.194
7	NCS7	.037	.126	.170	.559
8	NCS8	.760	.208	-.013	.042
9	NCS9	.050	.310	.296	.191
10	NCS10	.836	.204	.144	-.018
11	NCS11	.073	.065	.494	.437
12	NCS12	.248	.191	.577	-.219
13	NCS13	.059	.088	.720	.126
14	NCS14	-.022	-.065	.744	.094
15	NCS15	.110	-.130	.531	.259
16	NCS16	.759	.303	.226	.011
17	NCS17	.558	.291	.213	.141
18	NCS18	.025	.086	.641	.120
19	NCS19	.091	.041	.460	.389
20	NCS20	.200	.222	.573	-.106
21	NCS21	.738	.318	.057	.084
22	NCS22	.769	.240	.106	.016
23	NCS23	.101	.329	.222	.371
24	NCS24	.755	.229	.149	.154
25	NCS25	.218	.678	.024	.004
26	NCS26	.138	.406	.077	-.145
27	NCS27	.228	.723	.006	.085
28	NCS28	.178	.681	-.041	.164
29	NCS29	.075	-.083	.243	.549
30	NCS30	.038	.005	.112	.579
31	NCS31	.291	-.020	.217	.514
32	NCS32	.249	.077	.454	.248
33	NCS33	.083	.704	.057	.185
34	NCS34	-.060	.073	.132	.509
35	NCS35	-.137	.054	-.087	.518
36	NCS36	.157	.809	.098	.028

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 7 iterations
Note: NCS: Nature Contact Scale, CFAB: contact with friendly animals and birds, TNR: Trip to Nature Resorts, GNC: General Nature Contact, GAR: Gardening

The Nature Contact Scale (NCS) first draft's exploratory factor analysis results, offer factor loadings on four factors, are displayed in Table 2. The construct initially divided the items into four factors: GAR included nine items, CFAB included seven items, TNR included eight items and GNC included twelve items. An item was kept at a value of .5 in a designated factor. Bold faced factor loadings are those that are .5 or higher. Based on these findings, a total of 29 items were classified as follows: 9 items came under the GAR category, 6 items came under the CFAB category, 6 items came under the TNR category and 8 items came under the GNC category.

Table 3
Item total correlations for the 1ST draft of NCS (Items=36, N= 215)

S No.	Item No.		S No.	Item No.	
1	NCS1	.619**	19	NCS19	.454**
2	NCS2	.340**	20	NCS20	.437**
3	NCS3	.558**	21	NCS21	.663**
4	NCS4	.488**	22	NCS22	.636**
5	NCS5	.498**	23	NCS23	.481**
6	NCS6	.583**	24	NCS24	.669**
7	NCS7	.398**	25	NCS25	.480**
8	NCS8	.575**	26	NCS26	.261**
9	NCS9	393**	27	NCS27	.531**
10	NCS10	.660**	28	NCS28	.502**
11	NCS11	.482**	29	NCS29	.357**

12	NCS12	.407**	30	NCS30	.338**
13	NCS13	.454**	31	NCS31	.491**
14	NCS14	.334**	32	NCS32	.501**
15	NCS15	.361*	33	NCS33	.503*
16	NCS16	.707**	34	NCS34	.299**
17	NCS17	.634**	35	NCS35	.146* *
18	NCS18	.393**	36	NCS36	.548**

Note:**Correlation is significant at 0.01 level (2 tailed)

Table 3 displays the item total correlations for the first draft of the Nature contact scale (items = 36). There is a substantial relationship between each item and the final score. At this point, items with item total correlations of less than.3 should be eliminated in order to improve the construct validity of the scale before doing confirmatory factor analysis on them. Generally speaking, item-total correlation values greater than.30 are regarded as sufficient (field, 2014). As a result, the final draft consisted of 27 items after deleting such items (shown as bold faced) and also those having factor loading less than .5, in the previous table.

Table 4
Eigen values and percentages of variance for initially extracted, extracted and rotated sums of squared loadings for the 2nd draft of NCS (Items=27,N=215)

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.97	29.52	29.52	7.97	29.52	29.52	5.726	21.206	21.206
2	2.673	9.902	39.422	2.673	9.902	39.422	3.705	13.721	34.927
3	2.227	8.248	47.67	2.227	8.248	47.67	2.884	10.683	45.61
4	1.949	7.218	54.889	1.949	7.218	54.889	2.505	9.278	54.889
Extraction Method: Principal Component Analysis.									

Table 4 displays the Eigen values and percentage of variance for the elements that were ultimately selected and rotated from the second draft of the Nature Contact Scale (NCS).Presently, the four NCS (Nature Contact Scale) components account for 54.88% of the total variance explained. With rotated factors, every eigenvalue is greater than 2.

Table 5
Demographic characteristics of the 2nd sample used for confirmatory factor analysis (N=200)

Variable	N	%
Gender		
Male	108	54
Female	92	46
Age		
18-65	200	100
Marital Status		
Married	65	32.5
Unmarried	135	67.5
Education		
Primary	8	4
Matric	14	7
Intermediate	55	27
Bechlor/ Master	120	60
Higher Education	3	1.5
Profession		
Nil	136	68
Govt/Private job	30	15
Bussiness	29	14.5
Agriculture	5	2.5
Socioeconomic Status		
Upper class	15	7.5
Middle class	174	84
Lower class	11	5.5
Residence		
Urban	111	55.5
Rural	27	13.5
Hilly areas(Urban/rural)	62	31

Table 6
Goodness of fit for the first order measurement model of the 27-item Nature Contact Scale (NCS) N=200

x2	P	GFI	CFI	TLI	SRMR	RMSEA	PCLOSE
2.877	0	0.769	0.849	0.834	0.08	0.094	0

Important fit indices (CMIN/df, GFI, CFI, TLI, SRMR, and RMSEA) are displayed in Table 6 for the second draft, which included 27 items divided into four categories. The values obtained for the majority of the indices are less than those suggested by Hu and Bentler (1998). In order to produce a decent fit, the model is further adjusted by eliminating items with factor loadings less than.5 or.7 and

applying modification indices. As a result, the model does not demonstrate a strong match. Hair et al. (2010) state that factor loading estimates ought to be greater than 0.5, ideally 0.7 or higher.

Table 7
Goodness of fit for the first order measurement model of the 23-item Nature Contact Scale (NCS) N=200

x2	P	GFI	CFI	TLI	SRMR	RMSEA	PCLOSE
1.491	0	0.9	0.971	0.965	0.068	0.05	0.508

Table 7 demonstrates that the 23 item (4 factor) Nature Contact Scale (NCS) measurement model has a strong fit for all necessary indices. By using different threshold values for a number of fit indices, such as TLI, CFI, and RMSEA. Hu and Bentler proposed that, on average, a very good model–data fit is indicated by an RMSEA smaller than.06 and a CFI and TLI bigger than.95. The study by Hu and Bentler has gained a lot of traction, and many SEM procedures now use the suggested cutoffs (Xia & Yang, 20).

Table 8
Validity, Reliability and Inter scale correlations for the 1st order Measurement Model of the 3rd draft of NCS (Items =23, N=200)

	CR	AVE	MSV	MaxR(H)	GAR	GNC	CFAB	TNR
GAR	0.928	0.617	0.418	0.934	0.786			
GNC	0.89	0.623	0.259	0.916	0.268**	0.789		
CFAB	0.869	0.572	0.418	0.883	0.646***	0.509***	0.756	
TNR	0.924	0.714	0.226	0.951	0.474***	0.388***	0.476***	0.845

Note: † p < 0.100 *p < 0.050 **p < 0.010 ***p < 0.001, TNR: Trip to Nature Resort, CFAB: Contact with Friendly and Birds, GNC: General Nature Contact, GAR: Gardening

Table 8 displays the relatively good composite reliability for the third draft of Items=23, calculated using a new sample of N=200. Additionally, for all Nature Contact Scale (NCS) subscales, the AVE is greater than 0.5. Because of the improved model fit and lack of validity issues revealed by these results, the fourth draft of the scale, which has 23 items, will be the final set of items used for NCS.

Table 9
Goodness of fit for the 2nd order measurement model of the 23-item Nature Contact Scale (NCS) N=200

x2	P	GFI	CFI	TLI	SRMR	RMSEA	PCLOSE
1.542	0	0.9	0.968	0.961	0.07	0.052	0.364

Table 9 demonstrates that the 23 item (4 factor) 2nd order measurement model of the Nature Contact Scale (NCS) has a strong fit for all necessary indices. A low chi-square value in relation to the degrees of freedom denotes a better model fit. Chi-square is typically employed as an absolute fit metric.

Table 10
Validity and Reliability for the 2nd order Measurement Model of the 3rd draft of NCS (items=23, N=200)

	CR	AVE	MaxR(H)	NCS
NCS	0.787	0.5	0.851	0.7

Note: (NCS) Nature Contact Scale

The composite reliability for the Nature Contact Scale (NCS) second order structure is displayed in Table 10. The average variance extracted (AVE) for the four factor 2nd order measurement model (NCS) is equal to 0.5, and the final model's composite reliability is 0.787, which is pretty excellent. The construct's convergent validity is still considered acceptable if AVE is less than 0.5 and CR is greater than 0.6.

Discussion

The aim of the present investigation was to create a native tool for gauging the level of nature contact experienced by adult residents of Khyberpakhtunkhwa. For the purpose of qualitative item analysis and content validation, a pool of 85 items was first created and distributed among professionals in the fields of psychometrics and the pertinent categories of the scale. Once some of the judges' poorly rated items were removed, 45 items remained. Following a second round of judging the data from the pilot study, nine of the fifty items were removed and 36 were kept.

The second phase was doing an exploratory factor analysis on these 36 items using a data set of 215. The sample's demographic details are listed in Table 1. A statistic called the Kaiser-Meyer-Olkin Measure of Sampling Adequacy had a value of .861 showing that the data may benefit from a factor analysis. The results of the factor analysis generally won't be very relevant if the value was less than 0.5. Exploratory factor analysis employing principal component analysis with varimax rotation was thus carried out (Table 2). A multivariate statistical method called exploratory factor analysis (EFA) aims to identify as few hypothetical constructs as possible that can satisfactorily explain the covariance between a set of measured variables. The following stage involved performing Exploratory Factor Analysis with a data set of 215. This was carried out in order to identify the common components that explain the arrangement and structure of the variables being measured (Watkins, 2018). According to Brown (2015), a factor matrix's varimax rotation is an orthogonal rotation of the factor axis with the goal of maximizing the variance of the squared loadings of a factor (column) on all of the variables (rows). As a result, the original variables are differentiated according to the

extracted component. Varimax rotation is superior to all orthogonal rotation techniques since they often yield uncorrelated factors (Costello & Osborne, 2005). Since Varimax is the most widely used option in study literature, most psychology studies likely use it by default. The distribution of items into four factors—Gardening (GAR), Contact with Friendly Animals and Birds (CFAB), Visit to Nature Resort (VNR), and General Nature Contact (GNC)—was the outcome of the exploratory factor analysis (Table 2). The analysis was limited to these factors. Items having factor loadings lower than .5 and item total correlations lower than .3 were deleted from the first draft. Different factor loadings are recommended for varying sample sizes. Even extremely small loadings become statistically significant in very large samples. Accordingly, a loading of.722 for 50, .512 for 100, 364 for 200, .298 for 300, .21 for 600, and.162 for 1000 can all be considered noteworthy (Stevens, 2002). However, it is generally accepted in EFA that items with factor loadings less than 0.5 and those with high factor loadings more than one should be removed from the model. For this reason, we strictly adhered to this criterion and removed all items below the factor loading of .5 in the current analysis. Additionally, we computed item-total correlations for the entire scale to guarantee its homogeneity (Table 3). Items that showed an item total correlation greater than.3 were kept for use in confirmatory factor analysis in the final draft. Cristobal et al. (2007) set a cutoff point of 0.3 total item correlation as a benchmark for scale item initial evaluation and purification.

Furthermore, Table 4 shows that an eigen value of 2 was maintained for a factor on the scale. In factor analysis, an eigenvalue is a picture of the variance that can be accounted for by a single component or factor. It is employed to determine the optimal number of elements to keep without compromising too much data. Crawford et al. (2010) state that more variance is explained by each factor having an eigenvalue larger than one than by any one observable variable. For the 27 item draft (Table 4) for the study sample of 215 respondents, the four components that were retrieved explained almost 55% of the variance.

After the 27 items were eventually extracted and divided into 4 factors, a first order confirmatory factor analysis was carried out using AMOS (Analysis of Moment Structures) software. The AMOS (Analysis of Moment Structures) program is used to evaluate data related to structural interactions among latent variables, often known as structural equation modeling (SEM). Every latent variable, including response items, must be evaluated as part of the CFA measurement model process. Confirmatory factor analysis is almost frequently used to examine the latent structure of a test instrument. The structure of item-factor correlations (factor loadings) and the number of underlying instrument dimensions (factors) are confirmed in this case using CFA. Determining the final exam grade also benefits from CFA. A latent structure that is multifactorial—that is, when there are two or more factors—will have a pattern of item-factor relationships, which indicates which items load on which factors. The number of factors also serves as a good indicator of the number of subscales. According to Brown (2015), CFA may allow the use of total scores (composite of all items) in addition to subscale scores (composites of subsets of items) dependent on subsequent discoveries and analysis extensions.

For this investigation, a fresh set of 200 data were used to perform confirmatory factor analysis. Different rules-of-thumb can be used for sample size selection in Structural Equation Modeling. Boomsma (1985) suggested a minimum sample size of 100 or 200 whereas Bentler and Chou (1987) proposed 5 or 10 observations per estimated parameter. Table 5 provides the demographic details of the participants. Although it had no validity problems, the measurement model that was obtained (Table 6) did not offer a good model fit. Parsimonious Fit (Relative chi square) (CMIN/ df), Incremental Fit (AGFI, CFI, TLI, NFI), and Absolute Fit (RMSEA, GFI) are the three categories for model fits. The model is considered fit only if at least one fit is present. Usage of at least one index from each model fitness category is recommended by Holmes-Smith (2006) and Hair et al. (2010). Majority of the items had idealized regression weights of.7 or higher. However, some items were deleted only to improve the model fit because they had theoretical significance that was lower than that of other items with factor loadings in the same range and their standardized regression weights fell below the ideal level of.7.

Regarding the adjusted model (Table 7), every fit index fell within the necessary range, and there were no problems with validity or reliability (Table 8). The Average Variance Extracted (AVE) values exceeded the threshold of 0.5. Because Composite reliability was higher than AVE, the discriminant validity of each of the four subscales was likewise found to be good. The discriminant validity of each construct is determined by comparing its square root with the correlation coefficients between two relevant constructs (Nadeem et al., 2020). Standardized loading estimates of at least 0.5, and ideally 0.7 or higher; average variance extracted (AVE) of at least 0.5 to suggest adequate convergent validity; and a construct reliability of at least 0.7 to indicate adequate convergence or internal consistency are the general guidelines for construct validity given by Hair et al. (2006). Similarly, discriminant validity requires AVE > MSV (Baysal, 2019).

To demonstrate that the four factors in the Nature Contact Scale (NCS), namely (GAR), (CFAB), (TNR), and (GNC), could explain all of the Nature Contact variations in one factor, a second order confirmatory factor analysis using AMOS was carried out in the next phase. Consequently, we may state that the Nature Contact was a unidimensional construct that could be quantified using the Nature Contact Scale's four components. The model fit indices (Table 9) were within an acceptable range. Hu and Bentler (1998) state that in AMOS GFI ≥.90, TLI >.90, CFI >.90, RMSEA<.08, and PCLOSE >.05 are necessary for model fit. Additionally Construct validity and composite reliability were also satisfactory for this second order model (Table 10). The average variance extracted (AVE) for the four factor second order measurement model (NCS) was equal to 0.5, and the final model's composite reliability, at 0.787, was fairly excellent. This second order model's discriminant validity was likewise strong because MaxR(H) was higher than.70. By summing the total scores from the four domain scales, a general score on the target construct would be generated. To measure the domain, our plan would be to add up the scores on the facet scales. Subscale scores suggest that potential users will receive more in-depth information on certain Nature Contact subdomains in addition to a very accurate evaluation of the Nature Contact domain.

4. CONCLUSION

From all above analyses it is evident that Nature Contact scale is a valid and reliable instrument for measuring

degree of Nature Contact prevailing among the adults of Khyber Pakhtunkhwa. Further it will be a useful instrument for measuring the impact of Gardening (GAR), Contact with Friendly Animals and Birds (CFAB), Trip to Nature's Resort (TNR) and General Nature Contact (GNC) on different aspects of Mental Health. It will be an easy way of knowing therapeutic value of all these activities without using and intervention in these areas.

Conflict interests

The authors declare no conflict of interest.

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