Positive Mental Imagery and Mental Health amongst University Students in Pakistan

Akhtar Bibi, Simon E. Blackwell, Jürgen Margraf

Mental Health Research and Treatment Center, Faculty of Psychology, Ruhr-Universität
Bochum, Germany

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Author note:

Akhtar Bibi, <https://orcid.org/0000-0003-1494-6262>

Simon E. Blackwell, <https://orcid.org/0000-0002-3313-7084>

Jürgen Margraf, <https://orcid.org/0000-0001-5207-7016>

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Correspondence concerning this article should be sent to Akhtar Bibi, Mental Health Research and Treatment Center, Faculty of Psychology, Ruhr-Universität Bochum, Massenbergsstraße 9-13, 44787 Bochum, Germany. Email: akhtar.bibi@rub.de

Abstract

Objective: Mental health problems amongst university students pose a major public health challenge, and is particularly the case in Pakistan. Alongside broader societal and cultural pressures, cognitive factors likely also play a role in the development of and resilience to mental health problems and may provide a feasible target for interventions. The current study built on previous research in primarily European samples investigating the relationship between one cognitive factor, positive future-oriented mental imagery, and mental health, and aimed to extending this to university students in Pakistan.

Method: The study used a cross-sectional design, with a sample of university students in Pakistan ($N = 1838$) completing measures of mental imagery and mental health either on paper ($N = 1430$) or online ($N = 408$).

Results: Higher vividness of positive future-oriented mental imagery was associated with lower levels of depression symptoms and higher levels of positive mental health. In the sample completing the measures on paper, these relationships remained statistically significant even when controlling for socio-demographic and mental health-related variables.

Conclusion: The results provide a foundation for further investigating positive mental imagery as a potential mechanism of mental health and intervention target amongst university students in Pakistan.

Keywords: mental imagery, depression, students, positive mental health, Pakistan

Positive Mental Imagery and Mental Health amongst University Students in Pakistan

There is growing evidence for a high prevalence of mental health problems amongst Pakistani university students (Saleem, Mahmood, & Naz, 2013). A number of different factors such as academic stress, political instability, and financial constraints make these students a particularly vulnerable group for developing mental health issues. Recent research has highlighted the scale of this problem via cross-cultural comparison studies. For example, Pakistani students have higher symptoms of depression, stress and anxiety (Bibi, Lin, Zhang & Margraf, 2020), and lower positive mental health, life satisfaction, and social support (Bibi, Lin, & Margraf, 2020) compared to German students. Further, in comparison to German and Chinese students Pakistani students report a higher level of symptoms of mental disorders, a higher incidence of bullying in the workplace, and higher levels of suicidality, but are less likely to have received appropriate treatment (Bibi, Blackwell, & Margraf, 2019).

In this context it can be useful to identify cognitive factors that may be protective for mental health, as these may provide a useful target for preventive interventions; although what may ultimately be needed are societal changes, more effective mental health policies and better treatment provision, in the meantime simple interventions that can provide relief in the less distant future could be hugely valuable. One potentially relevant cognitive factor relates to the experience of mental imagery, in particular positive mental imagery of possible future events. Simulation of possible positive future events via mental imagery is thought to play an important functional role in daily life, for example in planning, decision-making, and motivating goal-directed behaviour (e.g. Schacter et al., 2008; Szpunar et al., 2014). Individual differences in the experience of future-oriented imagery have been associated both with depression and with positive aspects of mental health. For example, people experiencing symptoms of depression tend to generate less vivid

positive future imagery than non-depressed individuals (Holmes et al., 2016), whereas higher levels of optimism have been associated with more vivid positive future imagery (Blackwell et al., 2013; Ji et al., 2017). Although a causal role for imagery vividness in mental health has not yet been demonstrated, this seems a plausible hypothesis. For example, if someone can only dimly imagine positive events yet very vividly imagine negative events when they think about the future, this could make them feel less optimistic, more pessimistic, more hopeless, and more anxious. Positive imagery may also provide a suitable target for low-intensity interventions amongst Pakistani students, with one pilot study suggesting promise for a computerized positive imagery intervention in increasing positive imagery vividness and reducing depression symptoms (Bibi et al., 2020).

The present research therefore aimed to investigate the relationship between positive prospective imagery and mental health within a Pakistani student sample, building on and replicating results found in previous (primarily European) samples. While there was no a priori reason not to expect similar associations within a Pakistani sample, cross-cultural transferability of such findings cannot be assumed, particularly given limited cross-cultural research on mental imagery within clinical psychology (Blackwell, 2021). We used a cross-sectional dataset from 1841 university students in Pakistan that included measures of mental imagery as well as different aspects of mental health and socio-demographic variables. We aimed to investigate the relationship between positive mental imagery and both depression and positive mental health¹, hypothesizing that more vivid positive prospective imagery would be associated with lower levels of depression

¹ We originally planned to use the Life Orientation Test-Revised (Scheier et al., 1994), a measure of optimism, as our positive mental health-related variable, as per Blackwell et al. (2013) and Ji et al. (2017), but the internal consistency in our sample was low (Cronbach's alpha = .43 online, .55 offline), and hence we did not analyse it and examined a positive mental health scale instead.

and more positive mental health, including when controlling for additional potential confounding variables.

Methods

Participants

Data for the current study were collected within the Bochum Optimism and Mental Health study program (BOOM), intended to explore protective factors for positive and negative mental health. University students in Pakistan were recruited from different universities of Pakistan through online and offline sources (see Bibi, Lin, Zhang & Margraf, 2020; Bibi, Lin & Margraf, 2020). Participants were required to be a student aged 18-50 and fluent in English. Ethical approval was provided by the ethics committee for the Faculty of Psychology, Ruhr University Bochum, Germany (ref: 315). All participants provided informed consent on paper or online. Two thousand university students agreed to participate in the current research, but 160 participants did not complete the questionnaires and were excluded from analyses. After excluding 3 participants who did not complete the PIT, a total sample of 1838 participants (Gender: 59.6% female, 40.4 % male, $M_{age} = 22.84$, $SD_{age} = 3.01$) completed the entire battery of self-reported questionnaires ($N = 408$ online, $N = 1430$ on paper). Participants completing measures online did so in their own time from home, whereas those completing them on paper (“offline”) did so in group sessions in the university. All measures were completed in English, which is the official language used at Pakistani universities.

Measures

Prospective Imagery Test (PIT; Stöber, 2000; Holmes et al. 2008). The Prospective Imagery Test is brief self-administered inventory used to measure the vividness of prospective mental imagery vividness. It consists of 10 positive (e.g. “*People you meet will like you*”) and 10

negative (“*You will be the victim of crime*”) description of hypothetical future scenarios.

Participants were instructed to imagine each scenario as if happening to them in near future, then rate the vividness of their image on five-point scale ranging from 1 (*no image at all*) to 5 (*very vivid*). Previous studies have found the PIT to have good internal consistency (e.g., $0.83 < \alpha < 0.90$; Blackwell et al., 2013). In our sample of university students, for those completing the questionnaires online, Cronbach’s alpha was $\alpha=0.87$ for positive imagery vividness and $\alpha=0.77$ for negative imagery vividness. For participants completing the measures on paper, Cronbach’s alpha was $\alpha=0.73$ for positive imagery vividness and $\alpha=0.69$ for negative imagery vividness.

Depression Anxiety Stress Scales (short form: DASS-21; Henry & Crawford 2005).

The DASS-21 was used to measure participants’ symptoms of depression, anxiety and stress, with each of these 3 areas represented by a 7-item subscale. Participants rated how often during the past week they had experienced the symptoms listed on a scale ranging from 0 (*never*) to 3 (*almost always*). The score for each subscale is the sum of the relevant items. Cronbach’s alphas in our sample were as follows: In our online sample, depression: $\alpha = .82$, anxiety: $\alpha = .72$, stress: $\alpha = .75$. In our offline sample, depression: $\alpha = .77$, anxiety: $\alpha = .72$, stress: $\alpha = .74$.

Positive Mental Health (PMH-Scale; Lukat, Margraf, Lutz, van der Veld, & Becker, 2016). The 9-item PMH scale was used as a measure of positive mental health. It measures positive aspects of life experiences. Participants responded on a 4-point scale ranging from 0 (*do not agree*) to 3 (*agree*). In our online sample, $\alpha = 0.86$, and in our offline sample, $\alpha = 0.87$.

Social support scale (F-SozU K-14; Fydrich et al., 2009). The F-SozU K-14 was used to measure participants’ subjective sense of their social support. It consists of fourteen items, which participants were asked to rate on seven-point scale ranging from 1 to 7. Higher scores indicate

higher subjective social support. Cronbach's alphas in our sample were $\alpha = 0.88$ (online) and $\alpha = 0.86$ (offline).

Satisfaction with life scale (SWLS; Diener, Emmons, Larsen, Griffin, 1985). The one-dimensional SWLS was used to measure participants' life satisfaction. Participants responded on 7-point scale from 1 (*strongly disagree*) to 7 (*Strongly agree*). Higher scores indicate higher life satisfaction. Cronbach's alphas in our sample were $\alpha = .73$ (online) and $\alpha = .72$ (offline).

Resilience Scale (RS-11; Schumacher, Leppert, Gunzelmann, Strauß, & Brähler, 2005). The one-dimensional RS-11 was used to measure participants' perceived. Participants responded to items on 7-point scale ranging from 1 (*Disagree*) to 7 (*Agree*). Higher scores indicate higher resilience. Cronbach's alphas in our sample were $\alpha = .84$ (online) and $\alpha = .81$ (offline).

Health scale (EQ5D; Kind, 1996). Participants' perceived general health status of was measured using the EuroQol-5D-3L visual analogue scale. Participants responded on a Visual Analogue Scale (VAS), with scores ranging from "Best imaginable health state" (100) and "Worst imaginable health state" (0).

Data Analysis

Prior to our main data analysis, we checked whether we could combine the data collected online and offline for our analyses. To do so we tested measurement invariance using Multi-group Confirmatory Factor Analysis (Byrne, 2016) of the main measures we planned to analyses. For the PIT we could only establish configural measurement invariance (see supplementary material), which suggested that we could not combine offline and online data together. There was also a statistically significant difference in Cronbach's alpha for the two samples for both positive items ($X^2(1) = 78.28, p < .001$) and negative items ($X^2(1) = 12.23, p < .001$) of the PIT,

with lower internal consistency in the offline sample. We therefore analyzed the offline and online data separately².

To examine the relationship between positive imagery vividness and both depression and positive mental health, we conducted two separate hierarchical linear regressions, one with scores on the depression subscale of the DASS-21 as the dependent variable, and one with scores on the PMH as the dependent variable. Our main independent variable, vividness ratings for positive items on PIT, was entered in a first step. Other independent variables were then added in a series of further steps to see which, if any, rendered the relationship between positive PIT scores and the dependent variable no longer statistically significant (as per Ji et al., 2017). Sociodemographic variables were added in the second step, followed by negative PIT scores in a third step, measures of mental health (e.g. stress, anxiety) in a fourth step, and ‘positive’ measures such as resilience and life satisfaction in a fifth and final step.

Analyses were conducted in SPSS version 24, with the exception of the measurement invariance analysis, which was conducted in RStudio version (1.1.463). Data is available via <https://osf.io/9hbmK/>.

Results

Descriptive Statistics and Zero-Order Correlations

Table 1 and 2 shows descriptive characteristic for the offline and online sample and zero order correlation with positive items of PIT.

Regressions with Depression and Positive Mental Health as Dependent Variables

Five-step linear regressions were used to investigate the relationship between positive prospective imagery vividness and both depression and positive mental health.

² We note that if we had not checked this and simply combined the two samples the results would mirror those of the larger offline sample (see Supplementary Materials for details).

Results are described in Tables 2 (offline) and 3 (online). In the offline sample, scores on positive items of the PIT remained a significant predictor of scores on the DASS-21 depression scale even when controlling for all other confounding variable. Notably, although scores on the PIT explained only a small proportion of variance in DASS-21 depression scores, in the final regression they were the strongest predictor (i.e. largest β value) apart from scores on the other DASS-21 subscales (anxiety and stress). In the online sample, inclusion of negative imagery vividness on the PIT rendered the relationship between positive PIT scores and DASS-21 depression scores no longer statistically significant.

When scores on the PMH were the dependent variable, in the offline sample scores on positive items of the PIT were significant predictors of PMH scores even when including all other variables, and in fact were the strongest predictor (largest β value) in the final regression. In the online sample, including the measures of social support, life satisfaction, and resilience in the final step of the regression rendered the relationship between positive items on the PIT and PMH scores no longer statistically significant.

Discussion

This study investigated the relationship between positive prospective imagery vividness and both depression and positive mental health in a sample of university students in Pakistan. Results from a sample completing the measures pen-and-paper (“offline”, $N = 1430$) and another completing the measures online ($N = 408$) showed a statistically significant negative association between positive imagery vividness and depression, and a positive association between imagery vividness and positive mental health. In the pen-and-paper sample these relationships remained statistically significant when controlling for a wide range of other variables including demographics, measures of mental health and life satisfaction and perceived social support. These

results extend those found in previous populations to a Pakistani sample, and highlight the potential utility of investigating positive mental imagery as a mechanism in both negative and positive aspects of mental health.

The results in the larger pen-and-paper sample echo previous studies that have suggested very specific relationships between positive prospective imagery vividness and measures of mental health or resilience (e.g. Blackwell et al., 2013; Ji et al., 2017). That is, these relationships do not appear to simply be due to shared variance with other mental health or wellbeing-related measures, and this strengthens the suggestion that there is something specific about the imagery aspect of what is measured by the Prospective Imagery Test. It is however not possible to draw definitive conclusions as to why we did not find such strong unique associations within the online sample, for example whether this was due to differences in the samples themselves or related to the method of completing the questionnaires. Given the lack of measurement invariance on the PIT between the two samples there does appear to be differences in how the participants responded on this measure. It is possible that within the online version participants were more likely to click similar responses for similarly-valenced items (particularly as the questionnaire came at the end of a long online survey), which would be consistent with the higher internal consistency in the online sample and the negative correlation between the positive and negative subscales. This in turn would lead to the PIT being a less ‘true’ measure of imagery vividness. However, this is purely speculative.

The results from this study cannot in themselves provide evidence for prospective imagery playing a causal role in depression or positive mental health amongst Pakistani university students, but provide a firmer foundation for investigating the possibility of such causal relationships via experimental or interventional studies. In fact, one study has investigated a computerized positive imagery intervention amongst university students in Pakistan experiencing elevated symptoms of

depression, with promising results (Bibi, Margraf, & Blackwell, 2020). However, this was only a small pilot study and therefore in need of replication. Further, although this study and several previous ones have investigated the relationship between vividness of deliberately generated positive imagery and mental health measures, it is not clear that increasing this vividness is necessarily the best target for imagery interventions. For example, it could be that the relevant aspect of scores on the PIT reflect accessibility of positive episodic memory content and the ease with which this can be projected into the future, and it is this accessibility rather than vividness per se that should be the target of interventions. From this perspective a wider range of autobiographical memory-focussed interventions (e.g. Hitchcock et al., 2017) may be helpful. The prevalence of mental health difficulties amongst these students indicates a need for broader structural changes, but if simple and easily accessible interventions were available this would be helpful for those students currently experiencing symptoms of depression.

While the large sample size in the current study and the possibility to collect data via two different methods are strengths, the study has a number of limitations. First, although university students in themselves are an important sample to study the findings cannot necessarily be generalized to clinical or older populations in Pakistan. Second, which measures we were able to include in our regressions was determined by those included in the broader BOOM study from which this data came, and therefore not selected based on theoretical considerations of which measures would be most useful to investigate imagery specifically. Finally, these analyses were not pre-registered and as such are best considered exploratory rather than confirmatory.

In summary, this research highlights positive future-oriented imagery as an important mechanism to investigate in relation to both positive and negative aspects of mental health and thus a useful target for future research. Further, it extends previous research to a new sample and

culture, university students in Pakistan, providing a basis for future research investigating mental imagery as a mechanism in mental health and interventions in a population in great need of interventions.

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Table 1. Descriptive statistics, and zero-order correlations of PIT positive imagery vividness with other study variables in the offline and online samples.

Variable	Offline data (N=1430)		Online data (N=408)	
	M (SD) or N (%)	r ₀	M (SD) or N (%)	r ₀
PIT Positive Vividness	35.19 (6.39)		32.04 (8.71)	
PMH	17.53 (6.52)	.37***	17.04 (5.59)	.22***
RS	55.44 (13.17)	.30***	56.38 (12.10)	.19***
F-SozU K-14	50.26 (11.25)	.32***	48.94 (10.23)	.27***
SWLS	20.34 (6.50)	.14***	20.92 (5.86)	.13**
Socio-demographic variables				
Age (years)	22.59 (2.41)	.07*	23.71 (4.40)	-.08
Gender, N (%)		.09**		.07
Male	598 (41.8)		144 (35.3)	
Female	832 (58.2)		264 (64.7)	
Education, N (%)		-.01		.04
Bachelor	1351 (94.5)		396 (97.1)	
Master or Above	79 (5.5)		12 (2.9)	
EQ-5D	68.08 (30.65)	.18***	62.33 (26.44)	.10*
PIT Negative Vividness	29.16 (6.47)	.10***	27.45 (7.29)	-.18***
DASS-21				
Depression	7.79 (4.35)	-.15***	7.60 (4.38)	-.16***
Anxiety	8.52 (4.23)	-.06*	7.94 (3.91)	-.07
Stress	8.66 (4.12)	-.03	8.19 (3.70)	-.13**

Note. r₀=zero order correlations with PIT Positive Imagery Vividness = imagery vividness ratings for positive items on the Prospective Imagery Test (PIT). PMH = Positive mental health; RS = Resilience; F-SozU K-14= Social Support; SWLS = Satisfaction with life; EQ-5D = Euroqol-5D-3L (self-rated health from “Worst imaginable health state”, scored as 0, to “Best imaginable health state”, scored as 100); PIT Negative Imagery Vividness = imagery vividness ratings for negative items on the Prospective Imagery Test (PIT). For gender and education level, positive correlations indicate higher PIT positive scores for women and people with higher education levels, respectively. *p<0.05; **p<0.01; ***p<0.001.

Table 2. Regression analysis of depression and positive mental health (dependent variables) and positive prospective mental imagery vividness (independent variable) in the offline sample ($n=1430$).

Independent variable	Model 1 β	Model 2 β	Model 3 β	Model 4 β	Model 5 β
Dependent Variable: Depression					
PIT Positive Vividness	-.152***	-.155***	-.186***	-.123***	-.088***
Gender (female)		.068**	.089***	.018	.020
Age (years)		.083**	.106***	.044**	.044**
EQ-5D		-.045	-.023	-.033*	-.014
PIT Negative Vividness			.242***	.069***	.058***
Anxiety				.370***	.373***
Stress				.438***	.437***
PMH					-.044*
RS					.009
F-SozU K-14					-.058**
SWLS					-.040*
R^2	.023	.038	.094	.623	.631
Adjusted R^2	.022	.035	.091	.621	.629
ΔR^2 change	.023	.015	.057	.529	.008
F for ΔR^2	33.56***	7.18***	88.88***	997.14***	8.157***
F for model	33.56***	13.89***	29.57***	335.57***	220.81***
Dependent variable: Positive Mental Health					
PIT Positive Vividness	.366***	.333***	.348***	.330***	.211***
Gender (female)		-.010	-.020	-.020	-.043
Age (years)		.042	.031	.036	.037
EQ-5D		.179***	.168***	.162***	.107***
PIT Negative Vividness			-.119***	-.112***	-.081***
Depression				-.151***	-.081*
Anxiety				.046	.013
Stress				.097*	.073*

RS					.182***
F-SozU K-14					.180***
SWLS					.162***
R^2	.134	.167	.181	.190	.314
Adjusted R^2	.134	.165	.178	.186	.309
ΔR^2 change	.134	.033	.014	.009	.124
F for ΔR^2	221.40***	18.96***	23.73***	5.39**	85.24***
F for model	221.40***	71.66***	62.99***	41.75***	59.02***

Note. PIT Positive Imagery Vividness = imagery vividness ratings for positive items on the Prospective Imagery Test (PIT); PMH = Positive mental health; RS = Resilience; F-SozU K-14= Social Support; SWLS = Satisfaction with life; EQ-5D = Euroqol-5D-3L (self-rated health from “Worst imaginable health state”, scored as 0, to “Best imaginable health state”, scored as 100); PIT Negative Imagery Vividness = imagery vividness ratings for negative items on the Prospective Imagery Test (PIT). * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3. Regression analysis of depression and positive mental health (dependent variables) and positive prospective mental imagery vividness (independent variable) in the online sample ($N=408$).

Independent variable	Model 1 β	Model 2 β	Model 3 β	Model 4 β	Model 5 β
Dependent variable: Depression					
PIT Positive Vividness	-.163***	-.110*	-.064	-.047	-.019
Gender (female)		-.098*	-.085	-.036	-.032
Age (years)		.173***	.181***	.125***	.092**
EQ-5D		-.312***	-.288***	-.116***	-.084**
PIT Negative Vividness			.272***	.065*	.065*
Anxiety				.385***	.367***
Stress				.393***	.369***
PMH					-.011
RS					-.048
F-SozU K-14					-.050
SWLS					-.102**
R^2	.027	.173	.244	.676	.699
Adjusted R^2	.024	.165	.235	.670	.690
ΔR^2 change	.027	.147	.071	.432	.023
F for ΔR^2	11.06***	23.86***	37.68***	266.64***	7.43***
F for model	11.06***	21.12***	25.97***	119.25***	83.47***
Dependent variable: Positive Mental Health					
PIT Positive Vividness	.223***	.189***	.187***	.163***	.072
Gender (female)		-.049	-.050	-.075	-.086*
Age (years)		-.143**	-.144**	-.089	.008
EQ-5D		.253***	.252***	.160***	.068
PIT Negative Vividness			-.009	.076	.059
Depression				-.281***	-.018
Anxiety				.062	.027
Stress				-.106	-.123*

RS					.197***
F-SozU K-14					.206***
SWLS					.391***
R^2	.050	.139	.139	.218	.518
Adjusted R^2	.047	.130	.128	.202	.504
ΔR^2 change	.050	.089	.000	.079	.300
F for ΔR^2	21.27***	13.93***	.032***	13.41***	82.09***
F for model	21.27***	16.27***	12.99***	13.90***	38.66***

Note. PIT Positive Imagery Vividness = imagery vividness ratings for positive items on the Prospective Imagery Test (PIT). PMH = Positive mental health; RS = Resilience; F-SozU K-14= Social Support; SWLS = Satisfaction with life; EQ-5D = Euroqol-5D-3L (self-rated health from “Worst imaginable health state”, scored as 0, to “Best imaginable health state”, scored as 100); PIT Negative Imagery Vividness = imagery vividness ratings for negative items on the Prospective Imagery Test (PIT). * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Supplementary Material

Supplementary Table 1. Regression analysis of depression and positive mental health (dependent variables) and positive prospective mental imagery vividness (main independent variable) in total sample (N=1838).

Independent variable	Model 1 β	Model 2 β	Model 3 β	Model 4 β	Model 5 β
Dependent Variable: Depression					
PIT Positive Vividness	-.156***	-.143***	-.151***	-.102***	-.065***
Method of completion	.047*	.074**	.051*	.003	-.003
Gender (female)		.030	.050*	.001	.006
Age (years)		.124***	.139***	.072***	.066***
EQ-5D		-.101***	-.081***	-.055***	-.030*
PIT Negative Vividness			.243***	.063***	.054***
Anxiety				.377***	.377***
Stress				.430***	.425***
PMH					-.045**
RS					-.006
F-SozU K-14					-.058***
SWLS					-.051**
R^2	.024	.050	.107	.631	.642
Adjusted R^2	.023	.047	.104	.629	.640
ΔR^2 change	.024	.026	.058	.523	.012
F for ΔR^2	22.38***	16.63***	117.10***	1295.71***	15.16***
F for model	22.38***	19.16***	36.65***	390.29***	273.30***
Dependent variable: Positive mental health					
PIT Positive Vividness	.330***	.298***	.301***	.279***	.163***
Method of completion	-.029	-.041	-.033	-.031	.002
Gender (female)		-.007	-.013	-.012	-.043*
Age (years)		-.007	-.012	.005	.034
EQ-5D		.202***	.196***	.184***	.110***

SUPPLEMENTARY MATERIAL: POSITIVE MENTAL IMAGERY IN PAKISTAN

PIT Negative Vividness			-.081***	-.062**	-.040*
Depression				-.194***	-.085**
Anxiety				.049	.011
Stress				.078*	.050
RS					.201***
F-SozU K-14					.196***
SWLS					.201***
R^2	.106	.146	.152	.167	.331
Adjusted R^2	.105	.143	.149	.163	.327
ΔR^2 change	.106	.040	.006	.015	.165
F for ΔR^2	108.65***	28.42***	13.87***	10.65***	149.87***
F for model	108.65***	62.46***	54.73***	40.61***	75.37***

Note. PIT Positive Imagery Vividness = imagery vividness ratings for positive items on the Prospective Imagery Test (PIT); Method of completion = online (=1) vs. offline (=2); PMH = Positive mental health; RS = Resilience; F-SozU K-14= Social Support; SWLS = Satisfaction with life; EQ-5D = Euroqol-5D-3L (self-rated health from “Worst imaginable health state”, scored as 0, to “Best imaginable health state”, scored as 100); PIT Negative Imagery Vividness = imagery vividness ratings for negative items on the Prospective Imagery Test (PIT). * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Supplementary Table 2. Measurement Invariance of Prospective Imagery Test (PIT)

Models	N	Chi2/df	RMSEA	90% C.I.	CFI	TLI	SRMR	ΔCFI
Single group CFA-Original one factor model of Positive PIT								
offline	411	252.828/35	.066	.058-.074	.883	.850	.044	
online	14	67.202/35	.047	.030-.064	.977	.970	.032	
Multiple group CFA.								
Configural		320-030/70	.062	.056-.069	.923	.901	.038	
Weak		371.156/79	.063	.057-.070	.910	.898	.050	.013
Strong		409.981/88	.063	.057-.069	.901	.899	.052	.022

Models	N	Chi2/df	RMSEA	90% C.I.	CFI	TLI	SRMR	ΔCFI
Single group CFA-Original one factor model of PIT negative								
offline	1841	436.909/35	.090	.082-.097	.765	.698	.065	
online	7721	150.777/35	.090	.076-.105	.847	.803	.070	
Multiple group CFA.								
Configural		587.686/70	.090	.083-.096	.790	.730	.061	
Weak		599.255/79	.085	.078-.091	.789	.760	.062	
Strong		409.981/88	.063	.057-.069	.901	.899	.052	