Happiness and poverty in the very poor Peru: measurement improvements and a consistent relationship

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Abstract

Despite of poverty and extreme poverty estimations having decreased during the period 2006–2016 in Peru, from 49.1 to 20.7% and from 16.1 to 3.8%, respectively, the poor population still represents a latent concern for policy makers. Essentially, the main reason lies on the multidimensional problems of quality of life. Then, a research question yet unaddressed rises: Is it possible to find very poor people who feel happy? If so, what controls this relationship? The first main contribution of this study is the application of modern measurement theory to measure happiness. The short Oxford Happiness Questionnaire jointly with an ad hoc Multidimensional Poverty Index-MPI (8 items) were applied to a random sample of 537 household heads who live in the five poorest districts in Peru. Item response theory analysis was conducted to measure happiness scores. Findings reveal happiness scores and the MPI are negatively associated in the very poor Peru. Friendship, religiosity, and some relevant non-material characteristics of a family are the most important covariates of the relationship between these variables. In fact, the second contribution of this study represents the inclusion of variables associated to the quantity and quality of friendship as relevant controllers of happiness and poverty.

Keywords Peru · Happiness · Extreme poverty · Item response theory

1 Introduction

Research on the relationship between happiness and poverty among the very poor people has almost remained untouchable since Graham and Pettinato (2002) identified the paradox of unhappy growth in Peru and Russia: while poor people are happy, those with distinctive income gains are frustrated. Later, Lora et al. (2010) found consistent results in Latin America. In contrast, the relationship between inequality and happiness has been widely studied in the United States (Alesina et al. 2004; Oishi et al. 2011), in Germany (Ferrer-i-Carbonell 2005), and in Latin America (Graham and Felton 2005). Across all this amount of research the constructs of happiness and poverty emerge, and some questions,

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specifically about happiness, are raised: how it is defined, how it is measured, how reliable each measure is.

Independently of previous questions, there are other interesting questions this paper aims to study: What is the distribution of happiness scores among the very poor people in Peru? Is there a meaningful relationship between happiness and poverty among the very poor? What traits or characteristics of the very poor Peru, if any, control this relationship? Is it possible to think that people who lived with deprivation, they could be happy in any way? How relevant is the quality and quantity of friends for happy very poor people? To address all these research questions, household heads from the five poorest districts of Peru were surveyed in 2017 through an instrument that included the Oxford Happiness Inventory, 29 items which show different manifestations of happiness.

The existence of this kind of instrument, developed by psychologists Michael Argyle, Maryanne Martin, and Jill Crossland (as cited in Hills and Argyle 2002, p. 1073) in 1989, allows the authors to improve the measurement of happiness. Given, the hypothesized nature of this construct is continuous, item response theory was utilized to measure locations of individuals along the happiness. Conversely, poverty is a theoretical construct widely measured through different operationalizations. Multidimensional poverty index is the selected measure of poverty for this study; see Alkire and James (2011) for a complete discussion of this measure.

2 On happiness and measurement

There has been an enormous discussion on what happiness is from the classical time. Even if Aristotle set up a canonical definition happiness or *eudaimonia*, today the discussion continues and the schools focus on particular aspects of that (Aristotle n.d./2009). Four definitions may be stressed. From a perspective of several psychologists, happiness entails a state of satisfaction due to the situation of oneself in life which means to be able to pursuit purpose or meaning in life with no restrictions (Alidina 2015; Csikszentmihalyi 2008; Graham 2017; Hone et al. 2014; Steger 2012). First, happiness can be understood as a state of continuum satisfaction which is fulfilled when controlling inner experiences (Csikszentmihalyi 2008). Secondly, Alidina (2015) posited happiness as a level of mindfulness. It can be conceived as a state of alertness a person is to discard any negative feelings in the search for attaining happiness. Thirdly, Hone et al. (2014) reported happiness as a high level of subjective well-being after a process of flourishing, not only as individuals but also as a community. Finally, happiness is represented as a direct effect of having sought purpose of life and encompasses a person as a whole (Rappaport and Fossler 1993; Reker et al. 1987; Robak and Griffin 2000; Steger 2012). Based on these four definitions, three terms are used interchangeably: "happiness", "subjective well-being", and "life satisfaction" for many social scientists.

Along the same lines, happiness is an outcome of having attained a set of targets. From an individual standing, a person must prepare, cultivate and control their inner experience first to achieve happiness (Chen 2007; Koufaris 2002; Shernoff et al. 2003). This learning process implies the suppression of negative feelings (Academic Mindfulness Interests Group 2006; Langer 1989; Schonert-Reichl and Stewart 2010). Under a macro perspective, happiness is also the main goal of implementing public strategies that help citizens achieve a high level of subjective well-being (Fredrickson and Losada 2005; Keynes 2002, 2016). Certainly, happiness does not represent a guaranteed outcome. In fact, these public

strategies shall be considered as opportunities to seek fulfilling lives (Graham 2017). Thus, this paper suits the whole purpose of research when identifying needs or opportunities that may derive in public strategies with potential effects and ideal delivery.

From the umbrella of measurement, happiness metrics can be divided in hedonic metrics which capture the manifestations of happiness at a specific moment as daily lives occur; and evaluative metrics (eudaimonic metrics) which capture respondents' manifestations of their lives as a whole (Delle Fave et al. 2011; Graham and Nikolova 2013; Graham 2017; National Research Council 2013). Most studies of happiness measure it with one single question "How satisfied are you with your life?" and "How happy are you with your life" for evaluative purposes (Blanchflower and Oswald 2004; Frey and Stutzer 1995; Helliwell et al. 2018), or "Did you experience happiness yesterday?" and "Did you smiled yesterday?" for hedonic purpose (Graham and Pettinato 2002). In this paper, happiness is a latent variable.

All psychological measurements are unreliable in some degree (Croker and Algina 2008). They asserted when a test is administered, the only way of assuring results can be replicated if the same individuals were tested again under similar circumstances is through providing reliability estimates of the test (Croker and Algina 2008). Then, before any measurement instrument is used for research, its reliability must be established. To show jointly, a degree of correlation and agreement between measurements, intraclass correlation coefficient (ICC) is a desirable measure of reliability (Koo and Li 2016). Under the classical test theory Cronbach's coefficient alpha is one of the most used procedures for estimating reliability (internal consistency) and it is considered as the lower-bound estimate of reliability. Researchers who use happiness measures do not report either Cronbach's alpha or any ICC due to the dependability on a single question (Blanchflower and Oswald 2004; Frey and Stutzer 1995; Graham and Pettinato 2002; Helliwell et al. 2018).

3 Study objectives and questions investigated

Given the importance of Peruvian very poor population living the five poorest districts of Peru as a primary source of information for measuring happiness, the primary objective of the study was to improve the measurement of happiness and providing more evidence of the relationship between happiness and poverty. The focal questions investigated were:

1. What is the distribution of happiness scores among the very poor household heads?
2. Is there a meaningful relationship between happiness and poverty among the very poor household heads?

   a. What traits or characteristics of very poor household heads, if any, control this relationship?
   b. What are the main characteristics of these very poor household heads who are happy and why?

3. Can the results from the second research question consistent when using one single question to measure happiness?

Expressed in the form of a null and alternative hypotheses related to find a relationship between happiness and poverty among the very poor, they were:

$$H_0 : \rho_{XY} = 0$$

$$H_1 : \rho_{XY} \neq 0$$

where ρ represents a correlation coefficient, X represents the happiness scale and Y represents the multidimensional poverty index. The specificities associated with each scale measurement are described in the "Method" part.

4 Method

4.1 Design

To investigate whether there is a relationship between happiness and poverty controlled by other factors, a nonexperimental design was utilized.

4.2 Sample

To begin with, sampling units and unit of analysis are not the same in this study. The sampling unit of this study is the dwelling where a household lives in. The unit of analysis is each household head (participant). The National Institute of Statistics -INEI in Spanish-developed a monetary poverty ranking of 1943 districts (INEI 2015).[1] Based on census information of 2007, the dwellings database provided by INEI had a total of $N = 6889$ unique records for the five poorest districts of Peru.[2] It represented the usable sampling frame. A multistage random sampling design was conducted. In the last stage, the number of dwellings were allocated in four strata according to gender and literacy of the household head. Each stratum is composed of one interaction of these two factors: literate male, literate female, illiterate male, and illiterate female. Sample size determination yielded a random sample of $n = 537$ that was drawn from the sampling frame using a proportional allocation accordingly.

4.3 Instrumentation

The "Happiness, Poverty, and Values of Two Perus" survey contains 230 items divided in 12 sections (e.g., sociodemographic characteristics, education, happiness, social network, personal values, and religiosity, among others). Despite the length of the questionnaire, it was designed to elicit only pertinent information to the study.

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[1] This study belongs to a large project named "The determinants of happiness in two Perus: 2017" funded by the Office of the Vice Chancellor for Research at Universidad del Pacifico (Lima, Peru). Its main aim was to compare the level of happiness between the very poor and the very rich population of Peru (two strata). This study only focused on the five poorest districts, the very poor stratum. All derived inferences only pertain to this group.

[2] Technically, due to many dwellings in the rural area of Peru are abandoned, the number of dwellings is in fact, the number of households. In this way, overestimation of sample size is avoided.

4.3.1 Oxford Happiness Questionnaire (OHQ)

The OHQ consisted of 29 items with a different modified scale, four-point frequency scale instead of a six-point Likert scale (see the complete instrument in the "Appendix") Hills and Argyle (2002) acknowledged the construct of happiness measured by OHQ is considered as unidimensional. During the nineties, it has been widely used in Australia, Canada, Spain, UK, and USA. However, Yamamoto et al. (2008) stressed that happiness is strongly influenced by culture, specifically values. Failing to address that implies the omission of the role of each culture in any happiness conception. From that perspective, the OHQ also represents a composite instrument of measurement because it consists of items related to different definitions of happiness: hedonic, evaluative, optimistic, and community involvement.

While conducting the pilot survey, it was noticed that there were two types of head of household based on their skills to answer abstract questions. Only 2 out of 10 interviewees were able to answer the 29-items instrument. To anticipate item non-response issues, the shorter version of OHQ (eight items) was an option to answer questions regarding happiness. Thus, 81% of the final sample used the short instrument.

The lower-bound estimate of reliability over these eight ordinal-level items was determined using ordinal α (see Gugiu et al. 2010), assuming a unidimensional measurement model and accounting for the ordinal level scaling of the items. For the obtained sample $\alpha = 0.81$.

4.3.2 Cantril ladder question (WHR)

Since 2015, the World Happiness Report shows how people from different countries evaluate the quality of their current lives on a scale of 0–10. Additional details of this question is presented in Helliwell et al. (2018). While conducting the pilot survey, it was noticed that a scale of 0–20 was reasonable for data collection due to the grading scale of the Peruvian educational system.

4.3.3 Multidimensional Poverty Index (MPI)

It originally relies on 10 indicators embedded in three dimensions: health, education, and living standards (Alkire and James 2011). For this study, there were some ad hoc adjustments in the index calculation.

In the first dimension, only the nutrition indicator was considered. It was estimated through body mass index (BMI) as a proxy of caloric ingest due to timing reasons when administering the entire questionnaire. Regarding the second dimension, the dynamic nature of the school attendance indicator was modified to a static indicator due to data availability and renamed as childhood education (stock). No further adjustment occurred with the asset's indicator in the third dimension.[3]

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[3] The eight indicators used to measure the multidimensional poverty index were calculated as follows:
(1) BMI: Three thresholds provided by the Center for Disease Control and Prevention (CDC) and the World Health Organization (WHO) depending on age groups were used. (2) Years of education: Privation exists if a household member aged 12 years old or older, has reached the level of incomplete primary education. If all household members are deprived, then household is deprived. (3) Childhood education: Any child aged 11 years old or younger is deprived if his current educational attainment does not fulfill the expected level of education according to his schooling age. (4) Electricity: Privation exists if the household has no electricity. (5) Drinking Water: Privation exists if the household does not have access to drinking

4.4 Analysis

Closed-response data were imported to R 3.5.0 for processing and analysis (R Foundation for Statistical Computing 2018). For happiness measurement, polychoric correlations were calculated due to the polytomous nature of the eight items of short OHQ. Ordinal alpha was calculated through *psych* package. Then, IRT application through a graded response model (GRM) with logit link function produced an accurate estimate of each person's location on the latent construct continuum. Certainly, the discrimination and extremity parameters were also estimated. The GRM postulates that the conditional probability of the *i*th subject to endorse the *k*th response for the *j*th item is expressed as:

$$x_{ij}|z_i \sim Categorical\big(P_{ij1}, \ldots, P_{ijk}\big)$$

$$P\big(x_{ij} = k|z_i\big) = \begin{cases} \Psi\big(\eta_{ijk}\big), & if \quad k = 1 \\ \Psi\big(\eta_{ijk}\big) - \Psi\big(\eta_{ij(k-1)}\big), & if \quad 1 < k < K_i \\ 1 - \Psi\big(\eta_{ij(k-1)}\big), & if \quad k = K_i \end{cases}$$

$$\eta_{ijk} = \alpha_j\big(z_i - \beta_{jk}\big),$$

$$-\infty = \beta_{j0} < \beta_{j1} < \cdots < \beta_{jK_i - 1} < \beta_{jK_i} = \infty$$

$$i = 1, \ldots, m; \quad j = 1, \ldots, J; \quad k = 1, \ldots, K_i$$

x_{ij} is the ordinal manifest variable with K_i possible response categories, z_i is the standing of the *i*th subject in the latent continuum variable, α_j denotes the discrimination parameter, and β_{jk}'s are the extremity parameters. η_{ijk} is the linear latent predictor related to the trait. Finally, $\Psi()$ is the cumulative density function of the standard logistic distribution. Estimation of model parameters required the application of marginal maximum likelihood estimation (MMLE) using *Ltm* package. A detailed overview of this technique is presented in Baker and Seack-Ho (2004), Rizopoulos (2006), and Tarazona et al. (2013).

When regression analysis was conducted, coefficients' estimates and estimated standard errors are displayed where relevant. There is one single significance level, 5%. SAS 9.4 was performed for descriptive and inferential statistics.

Footnote 3 (continued)

water or the source is located more than 30 min on feet. (6) Sanitation: Privation exists if the household's sanitation facility is not improved, in other words, there are not protected pit latrines to flush toilets with a sewerage connection. (7) Floor: Privation exists if the household has a dirt, sand, or dung floor. (8) Cooking fuel: Privation exists if the household cooks with dung, wood, or charcoal very frequently. The last eight indicators report a missing value if the head of household did not respond to the related questions. After calculating all these indicators and their specific relative weights (they slightly changed in contrast to the original version), a person is identified as multidimensionally poor if he/she is deprived in at least one third of the weighted MPI indicators. In other words, his/her reported index is equal to or higher than 1/3.

Trait/characteristic	Total (n = 537) (%)	Male (n = 252) (%)	Female (n = 285) (%)
Multidimensionally poor	47.57	50.00	45.42
Health			
Body Mass Index	19.29	20.80	17.96
Education			
Years of education	20.86	22.22	19.65
Childhood education	14.53	15.48	13.68
Living standard			
Electricity	19.18	20.63	17.89
Drinking water	19.37	19.83	18.95
Sanitation	96.65	96.03	97.19
Floor	97.21	96.83	97.54
Cooking fuel	97.21	96.03	98.25

Table 1 Components of the Multidimensional Poverty Index

5 Results

5.1 Sociodemographic characteristics of the very poor heads of household

Before addressing the research questions, two findings can be stressed when analyzing the main characteristics of multidimensional poverty of the heads of households who live in the five poorest districts of Peru. See Table 1 for detailed traits. First, one out of five household heads report a BMI lower than 18.5 (CDC's threshold for individuals older than 19). Second, one out of five household heads report incomplete primary education as the highest level of education attained. Third, four out of five household heads have access to electric service as well as drinking water either with water connection inside or outside the house. Despite these findings, almost 100% of interviewees totally lack access to proper sanitation and almost every household head use wood as the main cooking fuel. Then, there are some health issues to consider when analyzing the poorest Peruvian population.

5.2 The distribution of happiness scores

The short OHQ consisted of 8 polytomous items on a four-point frequency scale: 'never' (1), 'sometimes' (2), 'most of the time' (3), and 'always' (4). Originally reversed-worded items were changed due to respondent inattention and confusion in two different pilot surveys (Van Sonderen et al. 2013). As shown in Fig. 1, the response pattern in each question displays a large concentration around the middle categories, "sometimes" and "most of the time". Four findings can be underlined. First, 48% of the very poor household heads feel "most of the time" they are satisfied about everything in their life. Second, 47% of the very poor household heads "always" have particularly happy memories of the past. Third, 25% of the very poor household heads feel "sometimes" they can fit in everything they want to. Finally, less than 7% "never" had particularly happy memories of the past, looked attractive, or felt that life is rewarding.
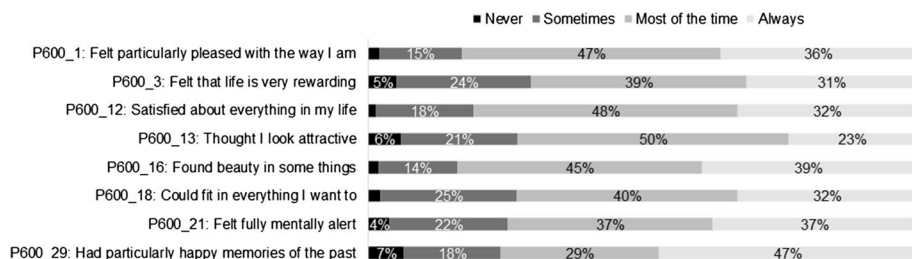
Fig. 1 Proportions for each level of response for the short OHQ 8 items

Table 2 Item analysis of the short version of OHQ

Item	Classic indexes				GRM indexes			
	Mean	SD	R.drop	Alpha	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\beta}_3$	$\hat{\alpha}$
P600_1	3.2	0.77	0.56	0.79	− 2.936	− 1.362	0.444	1.878
P600_3	3.0	0.87	0.56	0.79	− 2.358	− 0.819	0.638	1.767
P600_12	3.2	0.77	0.58	0.79	− 3.080	− 1.220	0.532	1.943
P600_13	2.9	0.84	0.56	0.79	− 2.371	− 0.946	0.974	1.618
P600_16	3.2	0.83	0.52	0.79	− 3.406	− 1.570	0.379	1.470
P600_18	3.1	0.85	0.49	0.80	− 3.585	− 1.062	0.727	1.271
P600_21	3.1	0.90	0.49	0.80	− 3.207	− 1.202	0.518	1.228
P600_29	3.2	1.02	0.50	0.80	− 2.677	− 1.244	0.078	1.267

R.drop = correlation item-total score dropping the item, Alpha = Cronbach alpha if an item is dropped, $\hat{\beta}_k$ = estimated extremity parameter, $\hat{\alpha}$ = estimated discrimination parameter

When fitting the model, an unconstrained GRM provides a better fit than the constrained model ($LRT = 27.23$, $df = 7$, $p < 0.001$). Regarding the estimated parameters, on one hand, Zickar et al. (2002) point out that when $\alpha_j > 1$ the item j provides an acceptable discrimination between individuals. Hafsteinsson et al. (2007) consider a highly discriminant item when $\alpha_j > 2$. On the other hand, Thiessen (1986) recommends eliminating items which have a very low power of discrimination $(\alpha_j < 0.5)$. Considering these criteria, it was found all items have an acceptable level of discrimination between individuals along the continuum of happiness. Moreover, estimations extremity parameters are acceptable (see Table 2).

When analyzing the Item Response Category Characteristic Curves (ICC), there is a high probability of endorsing the first option, "never", or conversely, there is a low probability of endorsing the fourth option, "always", for relatively low latent trait levels. These findings indicate that the items might be providing more information at low levels of happiness. Similar evidence can be derived from observing the Test Information Curve (these graphical evidences are not shown but are available upon request). The set of eight items provides 62% of the total information for low latent trait levels. In fact, items "mentally alert" and "happy memories of the past" provide little information in the whole latent trait continuum. These two items provide only 18.6% (i.e.,
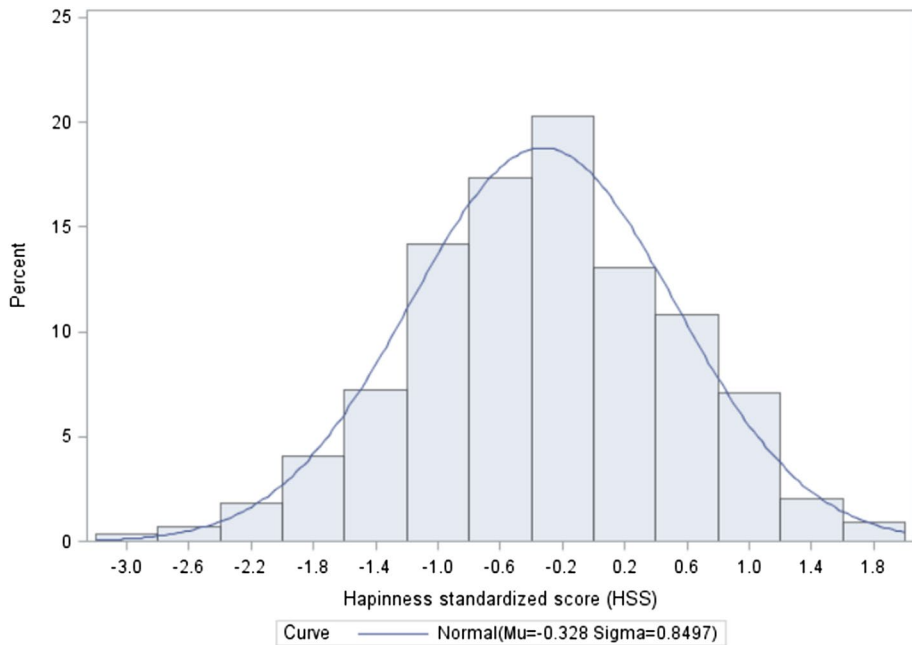
Fig. 2 The distribution of the happiness standardized scores for the short OHQ 8 items under the unconstrained GRM]

$100 \times 5.44/29.32$) of the total information. If a similar future study were conducted, these two items could probably be excluded.

Finally, the happiness scores using Empirical Bayes as the scoring method were estimated based on the observed response patterns (see Fig. 2). Different tests for normality, fail to reject the null hypothesis ($p > 0.15$). Using standardized scores, the average happiness level is -0.3282 ± 0.0367. This indicates that the very poor heads of household are mostly located in the low happiness continuum levels (66% of the sample).

5.3 Relationship between happiness and poverty among the very poor

There is a negative association between the happiness scores and the multidimensional poverty index for very poor household heads. This indicates that the higher the poverty index is reported, the lower the level of subjective well-being. Although the null hypothesis of no correlation was rejected ($p < 0.0001$), the strength of the relationship is weak ($r = 0.1831$).

5.3.1 Controllers of happiness

To further examine the effect of potential controllers of happiness (not considered causal), a multiple regression analysis was performed to determine if happiness score was related to the multidimensional poverty index (MPI*) and three sets of covariates: household characteristics; education, health, and work; and social network and a spiritual link. In the first group of covariates, there are household head's age (age), household head is female (fem),

Table 3 Summary statistics

Variable	Observations	Mean	SD
Happiness standardized score (HSS)	537	− 0.3797	0.8447
Multidimensional Poverty Index (MPI*)	533	0.4219	0.1745
Age	537	44.8156	16.0464
Female (1 = Yes)	537	0.5307	0.4995
Cohabiting (1 = Yes)	536	0.6026	0.4898
Married (1 = Yes)	536	0.2183	0.4135
Household size	537	3.8473	1.6319
1 Child at home (1 = Yes)	537	0.2551	0.4363
2 Children at home (1 = Yes)	537	0.1862	0.3896
One adult > 60 at home (1 = Yes)	537	0.1583	0.3654
Two adults > 60 at home (1 = Yes)	537	0.1080	0.3107
Elementary school education or higher (1 = Yes)	537	0.4060	0.4915
Obese (1 = Yes)	533	0.0413	0.1991
Self-employed/employee (1 = Yes)	536	0.6586	0.4746
Working hours (primary job)	494	60.9008	22.0952
Primary job satisfaction	518	2.9112	0.4935
Social net size, 1–10 friends (1 = Yes)	536	0.5989	0.4906
Social net size, > 10 friends (1 = Yes)	536	0.2481	0.4323
Social net strength, weekly (1 = Yes)	535	0.3963	0.4896
Social net strength, daily (1 = Yes)	537	0.2886	0.4536
Reliable friends (interaction)	535	0.2710	0.4449
Perception of getting help	511	4.3796	5.8946
God importance	537	9.5754	1.3053

All statistics show the number of observations, means, and standard deviations for each variable. God importance measures the respondent's assessment of God's presence in his/her life on a scale of 0–10, where 0 is irrelevant, and 10 is very relevant

household head is cohabiting (cohab), household head is married (married), household size (hhs), one child at home (ch1), two children at home (ch2), one adult older than 60 at home (old1), and two adults older than 60 at home (old2). The second group of covariates includes household head has elementary school education or higher (ese), household head is obese (obese), household head is self-employed or employee (see), working hours in primary job (whpj), and primary job satisfaction (pjs). The third group of covariates include social network size with 1–10 friends (fri10) and with more than 10 friends (fri11), social network strength on a weekly basis (netwee), social net strength in a daily basis (netday), reliable friends as an interaction of social network size with 10 friends or less and social network strength on a weekly basis (int1), perception of getting help (pgh); and God importance (god). See Table 3 for summary statistics. Examination of the residuals revealed that they are normally distributed ($p > 0.15$). Results indicated that the overall model appears to be a good fit, $F(22, 439) = 5.03, p < 0.0001$ and accounts for a moderate percentage of happiness scores variability, $R^2 = 0.2015$.

As shown in Table 4 (column 4), the multidimensional poverty index for heads of household contributed to the overall prediction of happiness. Despite a non-significant effect, for an increase of one percentage point in the poverty index, happiness scores

Table 4 Very poor household heads: control variables of two different operationalizations of happiness

	Happiness Standardized Score (HSS)				Contentment of whole life (CWL)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MPI for household head	−0.983*	−0.515*	−0.322	−0.432	−2.708*	−1.239	0.631	0.597
	(0.206)	(0.218)	(0.564)	(0.569)	(1.012)	(1.089)	(2.777)	(2.780)
Age		−0.0119*	−0.00978*	−0.0106*		−0.0311	−0.0249	−0.0260
		(0.00339)	(0.00358)	(0.00372)		(0.0169)	(0.0176)	(0.0182)
Female (=1)		−0.178*	−0.219*	−0.136		−0.188	−0.0317	0.291
		(0.0732)	(0.0972)	(0.107)		(0.366)	(0.479)	(0.523)
Cohab (=1)		0.206	0.170	0.178		0.443	0.489	0.703
		(0.110)	(0.112)	(0.115)		(0.550)	(0.554)	(0.564)
Married (=1)		0.369*	0.277*	0.290*		1.187	1.024	1.080
		(0.127)	(0.131)	(0.134)		(0.634)	(0.648)	(0.656)
Household size		0.00286	0.0141	0.00693		0.0576	0.0936	0.0904
		(0.0243)	(0.0246)	(0.0252)		(0.122)	(0.122)	(0.124)
One child at home (1=Yes)		0.167	0.223*	0.207*		0.374	0.501	0.400
		(0.0923)	(0.0934)	(0.0959)		(0.461)	(0.460)	(0.469)
Two children at home (1=Yes)		−0.0407	−0.0177	−0.0703		−0.669	−0.799	−0.881
		(0.0999)	(0.102)	(0.106)		(0.499)	(0.501)	(0.519)
One adult>60 at home (1=Yes)		0.232	0.214	0.244*		−0.343	−0.347	−0.313
		(0.125)	(0.126)	(0.129)		(0.624)	(0.621)	(0.634)
Two adults>60 at home (1=Yes)		−0.0401	0.0263	−0.00718		−0.721	−0.563	−0.806
		(0.149)	(0.153)	(0.159)		(0.749)	(0.757)	(0.783)
Elementary school education or higher (=1)			0.0610	0.00644			0.621	0.520
			(0.206)	(0.208)			(1.016)	(1.019)
Obese (1=Yes)			−0.132	−0.129			0.382	0.373
			(0.185)	(0.186)			(0.910)	(0.911)

Table 4 (continued)

	Happiness Standardized Score (HSS)				Contentment of whole life (CWL)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Self-employed/employee (= 1)			−0.101	−0.0213			0.297	0.747
			(0.106)	(0.112)			(0.524)	(0.548)
Working hours (primary job)			−0.00249	−0.00196			−0.00754	−0.00875
			(0.00184)	(0.00190)			(0.00907)	(0.00933)
Primary job satisfaction			0.413*	0.355*			2.205*	2.020*
			(0.0742)	(0.0771)			(0.366)	(0.378)
Social net size, 1–10 friends (1 = Yes)				0.263*				1.400*
				(0.135)				(0.661)
Social net size, > 10 friends (1 = Yes)				0.259				1.025
				(0.167)				(0.816)
Social net strength, weekly (1 = Yes)				0.0211				0.00962
				(0.167)				(0.816)
Social net strength, daily (1 = Yes)				0.0638				−0.0396
				(0.117)				(0.572)
Reliable friends (interaction)				0.0438				−0.433
				(0.176)				(0.861)
Perception of getting help				0.00516				0.000480
				(0.00676)				(0.0330)
God importance				0.0551				0.511*
				(0.0293)				(0.143)
R^2	0.041	0.113	0.177	0.201	0.013	0.054	0.140	0.181
Observations	533	532	484	462	530	529	481	459

*Statistically significant at $\alpha = 0.05$

reduce, on average, on 0.4317 standard deviations. Regarding the first group of covariates, several and relevant non-causal effects were detected. Both age and sex of household heads, increase and decrease happiness ($p = 0.005$ and $p = 0.204$, respectively). In fact, a female household heads reflect a lower subjective well-being in comparison to males. Marital status, either cohabitation or marriage, contribute positively to increase happiness and so does when a family's first child ($p = 0.031$). The last two findings are somehow opposite to Glass et al. (2016)'s study for industrialized societies. They claimed lower levels of happiness among parents than nonparents. Along these lines, with a marginally significant effect, living with an elder person contributes to make a household head happier ($p = 0.059$) because this person not only can provide free help to raise children (Dunifon 2012), but also can teach others on living experiences, as it happens in Asian societies (Rho 2014).

Regarding the second group of covariates, household heads are happier when they earn complete elementary education or higher. As a proxy of health status, being obese makes household heads less happy. A similar direction in the effect is obtained when either the household head works and for an additional working hour. All these four effects are not statistically significant but are consistent with previous studies (Alesina et al. 2004; Blanchflower and Oswald 2004; Graham and Felton 2005; Graham and Pettinato 2002; among others). In a sense of work-life balance, when household heads are more satisfied with their primary jobs, they are happier ($p < 0.001$). Although there is no evidence for this claim in a rural context, there is for an urban environment (Nylenna et al. 2005) and consistent with a meta-analytic finding (Bowling et al. 2010).

Finally, when analyzing the third group of covariates, there are plenty of evidence which support the presence of a social network in personal lives (Jiang and George 2015). Having at least one friend to talk to, to share experiences, good and bad moments in a daily or weekly basis, indeed, generate happier household heads. In the very poor Peru, the importance of God adds a spiritual environment which contributes to increase happiness of household heads ($p = 0.0604$). Analysis for multicollinearity by examination of eigenvalues and condition indexes revealed multicollinearity problem is not severe. Examination of variance inflation factors was omitted due to multiple coefficient of determination is low. Finally, the null hypothesis for homoscedasticity failed to be rejected, $\chi^2_{(248)} = 196.52$, $p = 0.9931$.

There have been several variables that have influenced happiness scores. Among these, it has been considered multidimensional poverty of the head of household, age, sex, marital status, having one child at home or living with an elder person or two, education, working hours, social net size and strength, religiosity to affect in the regression analysis. For starters, Kahneman and Deaton (2010) indicated that higher income increases positive affect. That analysis goes along the results presented, because more poverty, used as another proxy of objective welfare, reduces happiness. Considering Alesina et al. (2004), age resulted in a negative effect on happiness, and that is congruent with the results of this study. According to Ferrer-i-Carbonell (2005), being female increases happiness, but this is not the case for the very poor Peru, because of discrimination is still very present (Sulmont 2012). Furthermore, Blanchflower and Oswald (2004) found that married people report rising well-being, and the results of this study reach the same conclusion. Alesina et al. (2004) pointed out that children seem to bring preoccupations, stress and hard work and, thus, reduces happiness. Alesina's study was conducted in Europe and the USA. In Peru, there is a different view among creation of a family. Thus, this study partially differs from previous literature because only one child makes household heads happier but two does not.

Finally, as Waldinger (2017)[4] stated, social groups are powerful health promoters, then the conclusion from the presented analysis when stating social net size and strength have a positive impact on happiness is congruent. Following the subject of religion (Kahneman and Deaton 2010), religion has a substantial effect on increasing positive affect and reducing stress, so this is congruent to the analysis and obtaining a positive effect of religion on happiness.

5.3.2 Profile of those who are very poor and happy

In this negative association between poverty and happiness for the very poor household heads, four scenarios can be generated: happy and very poor, happy and not very poor, unhappy and not very poor, and unhappy and very poor; and one important question arose: What is the profile of those who consider themselves as happy and very poor household heads in comparison to those who feel unhappy and very poor? As shown in Fig. 3, three findings are quite relevant to point out. First, 26% of the happy and very poor household heads ($n = 131$) reported a lower proportion of no education at all in comparison to 44% of the unhappy and very poor ($n = 178$). Second, the happy and very poor ones reported a higher number of people they would ask for help in situations of crisis (8.12) in comparison to those who are unhappy very poor (3.41). Finally, regarding the social network strength in which a household head can talk to friends on a daily or weekly basis, the net is stronger for the happy and very poor (34%) in comparison to those who are unhappy and very poor (22%). This difference is due to the cultural values of people living in the Peruvian Andes (Walshe and Argumedo 2016).

5.4 A partial consistent relationship between life satisfaction and poverty

The main purpose of this section is to identify if the multidimensional poverty index (MPI*) is consistently related to happiness when using two different operationalizations. Thus, two model settings which differs in the measurement nature of the dependent variable are developed and controlled for a similar set of covariates in both cases. The first one considers the happiness standardized scores (HHS) which is a continuous score obtained from the endorsed ordinal responses of household heads and transformed with item response theory techniques. The second operationalization considers only one single question with a 0–20 scale to measure happiness as life satisfaction and labeled as Contentment of Whole of Life (CWL).

There is a negative association between the life satisfaction scores and the multidimensional poverty index for the very poor household heads. This indicates that the higher the poverty index is reported, the lower the level of contentment of whole life. Although the null hypothesis of no correlation was rejected ($p = 0.0077$), the strength of the relationship is very weak ($r = -0.1157$).

Table 4 reports the results obtained for both model settings. Columns (1) and (5) display results for the models including only the poverty index for household heads. As expected, MPI* is negatively correlated with happiness under both operationalizations, both results are statistically significant. For an increase of one percentage point in MPI*, household

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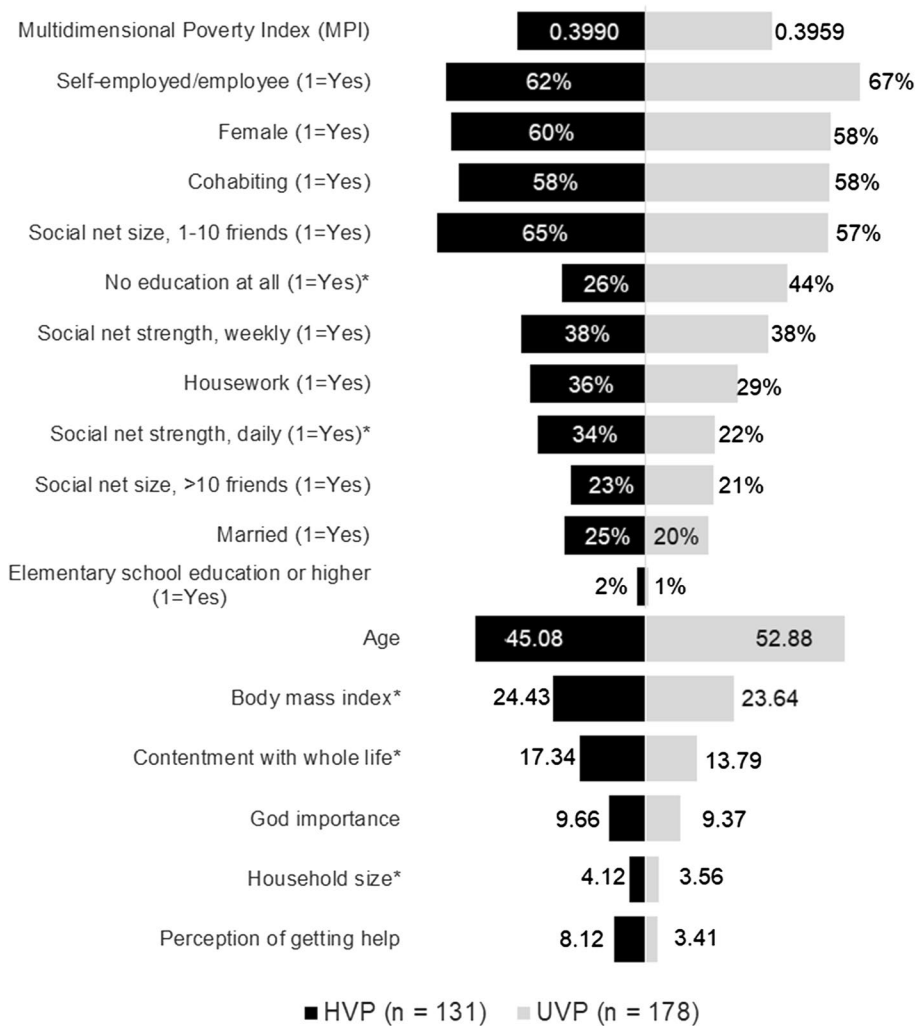[4] Waldinger, Robert. J.: The Study of Adult Development. [PowerPoint slides]. Retrieved from http://www.adultdevelopmentstudy.org/.

Trait	HVP	UVP
Multidimensional Poverty Index (MPI)	0.3990	0.3959
Self-employed/employee (1=Yes)	62%	67%
Female (1=Yes)	60%	58%
Cohabiting (1=Yes)	58%	58%
Social net size, 1-10 friends (1=Yes)	65%	57%
No education at all (1=Yes)*	26%	44%
Social net strength, weekly (1=Yes)	38%	38%
Housework (1=Yes)	36%	29%
Social net strength, daily (1=Yes)*	34%	22%
Social net size, >10 friends (1=Yes)	23%	21%
Married (1=Yes)	25%	20%
Elementary school education or higher (1=Yes)	2%	1%
Age	45.08	52.88
Body mass index*	24.43	23.64
Contentment with whole life*	17.34	13.79
God importance	9.66	9.37
Household size*	4.12	3.56
Perception of getting help	8.12	3.41

■ HVP (n = 131)   ▪ UVP (n = 178)

Fig. 3 Profile of the happy very poor (HVP) and unhappy very poor (UVP) household heads based on a group of traits. *The difference between these two groups is statistically significant at $\alpha = 0.05$

heads are less happy, on average, in 0.983 standard deviations in HSS, and in 2.70 units in the CWL score. Overall, these effect sizes are small and negligible -in terms of Cohen's f^2 —for specifications (1) and (5), respectively (Cohen 1988). Thus, in columns (1) and (5), effect sizes account for 4% and 1% of the happiness operationalizations variances, respectively. For a Cohen's f^2 to be considered a small effect size, it must be at least 2% but not greater than 15%.

In the overall process of adding covariates, the control variables of happiness show a more consistent relationship with the first operationalization (HSS) in comparison to the second one (CWL). Despite MPI* lost statistical significance in specifications (3) and (4), the direction of the relationship remained negative. In addition, only the variable 'two adults older than sixty at home' changed the expected direction of the relationship, see

specification (3) in Table 4. This variation could be due to the presence of multicollinearity identified previously. Although was not severe, it certainly can generate incorrect estimations. Regarding 'contentment with the whole life', certainly MPI* lost statistical significance since specification (6) but what matters is the persistent change in the direction of the relationship, see specifications (7) and (8) in Table 4. Moreover, five variables have incongruent estimated coefficient signs when analyzing the specification (8): 'female', 'only one adult over sixty at home', 'obese', 'self-employed', 'social net strength (daily)', and 'reliable friends'. It brings some concerns how the direction of the relationship of these variables with CWL remains inconsistent and contrary to what was expected.

Finally, examination of the residuals with the Kolmogorov–Smirnov test for normality revealed that the null hypothesis fails to be rejected consistently for HSS models but is rejected for all specifications under CWL. Both full models for HSS and CWL -see specifications (4) and (8)- accounts for a certain level of the dependent variable variability, 20% and 18%, respectively.

6 Conclusions

This study sought to address three questions. The first question investigated the distribution of happiness scores among the Peruvian very poor household heads who live in the five poorest districts. One of the best contributions of this paper is the application of the OHQ to measure the latent trait of happiness. The eight items of the short version revealed that, holding the assumption of an underlying latent continuum for happiness, the scores distribution is symmetric. When categorizing the variable, 66% of the very poor household heads are unhappy. This finding is important because not only the measurement instrument captures different timing aspects of happiness (past, present, and future), but also due to the application of IRT, measurement error reduces.

The second question this study investigated was if there was a meaningful relationship between happiness and poverty among the Peruvian very poor household heads. When comparing happiness and poverty ($r = -0.1831$), the result shows an opposite direction to the paradox stated by Graham and Pettinato (2002) and Lora et al. (2010). In both studies, authors claimed while poor people are happy, those with distinctive income gains are frustrated. However, even in a context of poverty, there are household heads who are very poor and unhappy, as well. Several control variables influenced on this relationship. Traits such as age, sex, and being married, also seen as a proxy of friends, revealed that happiness depends on them, equally or more. Similarly, to these objective traits, subjective characteristics can influence the level of happiness of a person. If individuals experience good quality of human relationships with family, friends and acquaintances, then they internalize that in moments of need, they have their own personal social protection net (Li and Kanazawa 2016). In this regard, perception of getting help plays an important role, the more people to ask for help, the more happiness scale reported. This help can be divine as well, the presence and importance of God in quite a religious country as Peru is, contributes to increase levels of happiness (Marzal et al. 2002; Valenzuela et al. 2009). In fact, based on this survey study, 90% of very poor household heads in Peru indicated God was very important in their lives.

From the negative relationship between happiness and poverty, previously mentioned, two groups were distinguished: household heads who are happy and very poor and household heads who are unhappy and very poor, to build up their profiles. Mainly, happy and

very poor household heads trust in more people than the other group. Parallelly, not having friends and talking to them daily could derive in what Waldinger (2017) denominated, the crisis of loneliness.[5]

The third question this study investigated was whether the results from the second research question were consistent to the classic measurement of happiness (one single question regarding life satisfaction). Essentially this question tried to answer if there was external validity of the results to a different measurement technique (operationalization) of the outcome variable. When comparing life satisfaction and poverty, the relationship was negative and very weak ($r = -0.1157$). However, when controlling for other variables, this relationship turned out positive.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Appendix: Module 600: happiness

		Never?	Slightly?	Enough?	Very much?	Does not know/ does not answer
601.	Are you happy with the way you are?	1	2	3	4	5
602.	Do you care for people being well?	1	2	3	4	5
603.	Do you feel that life rewards you?	1	2	3	4	5
604.	Are you kind/attentive to others?	1	2	3	4	5
605.	Do you wake up wanting to live?	1	2	3	4	5
606.	Do you feel that good things are going to happen later?	1	2	3	4	5
607.	Are you bored with many things?	1	2	3	4	5
608.	Do you always participate in activities for others?	1	2	3	4	5
609.	Do you believe or believe that life is good?	1	2	3	4	5
610.	Do you think that the world is a good place to live?	1	2	3	4	5
611.	Do you laugh a lot?	1	2	3	4	5
612.	With everything you've done in your life, are you happy?	1	2	3	4	5

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[5] Waldinger, Robert. J.: The Study of Adult Development. [PowerPoint slides]. Retrieved from http://www.adultdevelopmentstudy.org/.

	Never?	Slightly?	Enough?	Very much?	Does not know/does not answer
613. Do you think of yourself as pretty?	1	2	3	4	5
614. Do you do what you like to do?	1	2	3	4	5
615. Are you very happy?	1	2	3	4	5
616. Do you find that some things are pretty?	1	2	3	4	5
617. Do you always make others happy?	1	2	3	4	5
618. Do you think you adapt easily to anything you want to do?	1	2	3	4	5
619. Do you feel that you are managing your life?	1	2	3	4	5
620. Do you feel you can start new things?	1	2	3	4	5
621. Are you aware of what is happening around you?	1	2	3	4	5
622. Are you almost always happy and happy?	1	2	3	4	5
623. Can you make decisions quickly?	1	2	3	4	5
624. Do you know why you came to the world?	1	2	3	4	5
625. Do you feel that you have a lot of energy?	1	2	3	4	5
626. When you help in an event, does it almost always go well?	1	2	3	4	5
627. Do you like other people's company?	1	2	3	4	5
628. Do you feel healthy?	1	2	3	4	5
629. Do you have many beautiful memories of the past?	1	2	3	4	5

References

Academic Mindfulness Interests Group: Mindfulness-based psychotherapies: a review of conceptual foundations, empirical evidence and practical considerations. J. Psychiatry **40**(4), 285 (2006)

Aristotle.: The Nicomachean Ethics (Translated by W. D. Ross & L. Brown). Oxford University Press, Oxford (n.d.)

Alesina, A., Di Tella, R., MacCulloch, R.: Inequality and happiness: are Europeans and Americans different? J. Public Econ. (2004). https://doi.org/10.1016/j.jpubeco.2003.07.006

Alidina, S.: The Mindful Way Through Stress. The Proven 8-Week Path to Health, Happiness, and WELL-BEING. Guilford Publications, New York (2015)

Alkire, S., James, F.: Counting and multidimensional poverty measurement. J. Public Econ. **95**(7–8), 476–487 (2011)

Baker, F.B., Seack-Ho, K.: Item Response Theory: Parameter Estimation Techniques, 2nd edn. CRC Press, Boca Raton (2004)

Blanchflower, D.G., Oswald, A.: Well-being over time in Britain and the USA. J. Public Econ. **88**(7–8), 1359–1386 (2004)

Bowling, N., Eschleman, K., Wang, Q.: A meta-analytic examination of the relationship between job satisfaction and subjective well-being. J. Occup. Organ. Psychol. (2010). https://doi.org/10.1348/096317909X478557

Chen, J.: Flow in games (and everything else). Commun. ACM **50**(4), 31–34 (2007)

Croker, L., Algina, J.: Introduction to Classical and Modern Test Theory. Cengage Learning, Ohio (2008)

Csikszentmihalyi, M.: Flow: The Psychology of Optimal Experience. Harper Collins, New York (2008)

Cohen, J.: Statistical Power Analysis for the Behavioral Sciences, 2nd edn. Department of Psycology, New York University, New York, NY. Lawrence Erlbaum Associates, Publishers (1998)

Delle Fave, A., Brdar, I., Freire, T., Vella-Brodrick, D., Wissing, M.: The eudaimonic and hedonic components of happiness: qualitative and quantitative findings. Soc. Indic. Res. (2011). https://doi.org/10.1007/s11205-010-9632-5

Dunifon, R.: The influence of grandparents on the lives of children and adolescents. Child. Dev. Perspect. **7**, 55–60 (2012)

Ferrer-i-Carbonell, A.: Income and well-being: an empirical analysis of the comparison income effect. J. Public Econ. **89**, 997–1019 (2005)

Fredrickson, B., Losada, M.: Positive affect and the complex dynamics of human flourishing. Am. Psychol. (2005). https://doi.org/10.1037/0003-066X.60.7.678

Frey, B.S., Stutzer, A.: Happiness and Economics. Princeton University Press, Princeton (1995)

Glass, J., Simon, R., Anderson, M.: Parenthood and happiness: effects of work-family reconciliation policies in 22 OECD countries. Am. J. Sociol. (2016). https://doi.org/10.1086/688892

Graham, C.: Happiness for All? Usual Hopes and Lives in Pursuit of the American Dream. Princeton University Press, New Jersey (2017)

Graham, C., Felton, A.: Inequality and happiness: insights from Latin America. J. Econ. Inequal. **4**(1), 107–122 (2005)

Graham, C., Nikolova, M.: Happy peasants and frustrated achievers? Agency, capabilities, and subjective well-being. Human Capital and Economic Opportunity Global Working Group. Working Paper No 2013-013. Economics Research Center. University of Chicago (2013)

Graham, C., Pettinato, S.: Winners, losers and subjective well-being in new market economies. J. Dev. Stud. **38**(4), 100–140 (2002)

Gugiu, C., Coryn, C., Applegate, B.: Structure and measurement properties of the Patient Assessment of Chronic Illness Care instrument. J. Eval. Clin. Pract. **16**(3), 509–516 (2010)

Hafsteinsson, L., Donovan, J., Breland, T.: An item response theory examination of two popular goal orientation measures. Educ. Psychol. Meas. **67**(4), 719–739 (2007)

Hills, P., Argyle, M.: The Oxford Happiness Questionnaire: a compact scale for the measurement of psychological well-being. Personal. Individ. Differ. **33**, 1073–1082 (2002)

Helliwell, J., Layard, R., Sachs, J.: World Happiness Report 2018. Sustainable Development Solutions Network, New York (2018)

Hone, L., Jarden, A., Schofield, G., Duncan, S.: Measuring flourishing: the impact of operational definitions on the prevalence of high levels of wellbeing. Int. J. Wellbeing (2014). https://doi.org/10.5502/ijw.v4i1.4

Instituto Nacional de Estadística e Informática (INEI).: Mapa de pobreza provincial y distrital 2013, Lima, Peru (2015). Retrieved from: https://www.inei.gob.pe/media/MenuRecursivo/publicaciones_digitales/Est/Lib1261/Libro.pdf

Jiang, K., George, A.B.: Guanxi networks in China. J. Contemp. East. Asia **12**(2), 89–97 (2015)

Kahneman, D., Deaton, A.: High income improves evaluation of life but not emotional well-being. PNAS **107**(38), 16489–16493 (2010)

Keynes, C.: The mental health continuum: from languishing to flourishing in life. J. Health Soc. Behav. **43**(2), 207–222 (2002)

Keynes, C.: Why flourishing? In: Harward, D. (ed.), Well-Being and Higher Education, Washington DC, pp. 99–107 (2016)

Koo, T., Li, M.: A guideline of selecting and reporting intraclass correlation coefficients for reliability research. J Chiropr. Med. **15**(2), 155–163 (2016)

Koufaris, M.: Applying the technology acceptance model and flow theory to online consumer behavior. Zicklin School of Business, Nueva York (2002)

Langer, E.: Mindfulness. Addison Wesley Longman, Reading (1989)

Li, N., Kanazawa, S.: Country roads, take me home… to my friends: how intelligence, population density, and friendship affect modern happiness. Br. J. Psychol. (2016). https://doi.org/10.1111/bjop.12181

Lora, E., Powel, A., van Praag, B., Sanguinetti, P.: The Quality of Life in Latin American Cities. The Inter-American Development Bank, Washington, DC (2010)

Marzal, M., Romero, C., Sánchez, J.: La religión en el Perú al filo del milenio. PUCP - Fondo Editorial, Lima (2002)

National Research Council: Subjective Well-Being: Measuring Happiness, Suffering, and Other Dimensions of Experience. Panel on Measuring Subjective Well-Being in a Policy-Relevant Framework. A.A. Stone and C. Mackie, Editors. Committee on National Statistics, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press (2013)

Nylenna, M., Gulbrandsen, P., Forde, R., Aasland, O.: Unhappy doctors? A longitudinal study of life and job satisfaction among Norwegian doctors 1994–2002. BMC Health Serv. Res. (2005). https://doi.org/10.1186/1472-6963-5-4

Oishi, S., Kesebir, S., Diener, E.: Income inequality and happiness. Psychol. Sci. **22**(9), 1095–1100 (2011)

Rappaport, H., Fossler, R.: Future time, death anxiety, and life purpose among older adults. Death Stud. **17**(4), 369–379 (1993)

Reker, G., Peacock, E., Wong, P.: Meaning and purpose in life and well-being: a life-span perspective. J. Gerontol. **42**(1), 44–49 (1987)

Rho, W.: Triple helix for social innovation: the Saemaul Undong for eradicating poverty. J. Contemp. East. Asia **13**(1), 39–55 (2014)

Rizopoulos, D.: ltm: an R package for latent variable modeling and item response theory analyses. J. Stat. Softw. **17**(5), 1–25 (2006)

Robak, R., Griffin, P.: Purpose in life: What is its relationship to happiness, depression, and grieving? N. Am. J. Psychol. **2**(1), 113–119 (2000)

Schonert-Reichl, K., Stewart, M.: The effects of a mindfulness-based education program on pre- and early adolescents' well-being and social and emotional competence. University of British Columbia, Vancouver (2010)

Shernoff, D., Csikszentmihalyi, M., Schneider, B., Elise, S.: Student engagement in high school classrooms from the perspective of flow theory. School Psychol. Q. **18**(2), 158–176 (2003)

Steger, M.: Making meaning in life. Psychol. Inq. (2012). https://doi.org/10.1080/1047840X.2012.720832

Sulmont, D.: Raza y etnicidad desde las encuestas sociales y de opinión: dime cuántos quieres encontrar y te diré qué preguntar. In: Sanborn, C.A. (ed.) La discriminación en el Perú: balance y desafíos, pp. 51–74. Universidad del Pacífico, Lima (2012)

Tarazona, E., Bazán, J., Aparicio, A.: Actitudes hacia la estadística en universitarios peruanos de mediana edad. Rev. Dig. Investig. Docencia Univ. **7**(1), 57–76 (2013)

Thiessen, D.: Multilog: Item Analysis and Scoring with Multiple Category Response Models (Version 6) [Software]. Mooresville, IN: Scientific Software (1986)

Valenzuela, J., Scully, T., Somma, N.: Social and political effects of religiosity and religious identities in Latin America. Kellogg Institute: Working Paper 362 2009. Retrieved from: https://kellogg.nd.edu/sites/default/files/old_files/documents/362_0.pdf

VanSonderen, E., Sanderman, R., Coyne, J.: Ineffectiveness of reverse wording of questionnaire items: let's learn from cows in the rain. PLoS ONE **8**(7), e68967 (2013)

Yamamoto, J., Feijoo, A., Lazarte, A.: Subjective wellbeing: an alternative approach. In: Copestake, J. (ed.) Wellbeing and Development in Peru: Local and Universal Views Confronted, pp. 61–102. Palgrave, New York (2008)

Walshe, R., Argumedo, A.: Ayni, Ayllu, Yanantin and Chanincha: the cultural values enabling adaptation to climate change in communities of the Potato Park, in the Peruvian Andes. GAIA **25**(3), 166–173 (2016)

Zickar, M., Russel, S., Smith, C., Bohle, P., Tilley, A.: Evaluating two morningness scales with item response theory. Pers Individ. Differ. **33**(1), 11–24 (2002)

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