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Constructing the Facets of Altruistic Behaviors (FAB) Scale

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Author Contributions

S.W. delineated the study design, constructed the items, drafted the manuscript, and helped analyzing the data. L.B. assisted in constructing the scale, collected the data, performed main portions of data analysis and helped with paper writing. M.S. helped conceptualizing the studies methodologically, analyzed the data, visualized the results, and helped writing the manuscript.

Abstract

Behavior is effectively altruistic to the degree that it is costly for the actor while benefiting others. In a series of preregistered studies, we constructed a 15-item self-report scale assessing three different facets of altruistic behavioral traits: help-giving, moral courage, and peer punishment. Item selection was performed with the help of Ant Colony Optimization (ACO) procedures as implemented in the *stuart* package for R. Confirmatory factor analysis of the three-factor measurement model showed excellent fit, outperforming classical item selection procedures. The scale was structure-validated in a second sample using a multiple group model that showed full measurement and structural invariance. A pilot study shows correlations of the subscales with economic game decisions. We discuss the scale structure and potential applications.

Keywords: altruism, costly punishment, moral courage, ant colony, scale construction

The Concept of Altruism

From an effective point of view, as is characteristic for biology, economics, and behaviorism, altruism can be defined as costly behavior that benefits others (Fehr & Fischbacher, 2003; Kerr et al., 2004; Wilson, 1992). The definition relates to the input-output (cost-benefit) relation of actions, without referring to mental states, and allows altruism to be inferred from observed behaviors. Scientists choose such objective definitions in search of *ultimate* explanations when analyzing the effects of behavioral phenotypes on system interactions and population dynamics. Under this premise, only the consequences of actions count. By contrast, *proximate* variables, in describing the mediating mechanisms within the individual, refer to subjective intentions and goal states. What defines altruism from this viewpoint are the other-concerned benevolent intentions of the actor (Andreoni et al., 2010; Rodrigues & Hewig, 2020). From an overall scientific standpoint, the issue cannot be which definition is “better”, but what question is being pursued and for what purpose (Mayr, 1961; Tinbergen, 1963; Wilson, 1992, 2015).

Cost-benefit ratios preferred for oneself versus another also define Social Value Orientation (SVO, e.g., Murphy & Ackermann, 2014). The framework describes altruism as choice behavior that maximizes the benefit to the other while disregarding the outcome to oneself. The altruistic preference adjoins, but is distinct from, *prosocial* choice which maximizes joint gain for self *and* other or minimizes inequality between self and other. A similar distinction has been made in the biological altruism literature between absolute and relative fitness costs (Wilson, 2015), and in economics between strong and weak reciprocity (Fehr & Fischbacher, 2003). Likewise, psychologists have referred to altruistic motivation only when the goal is purely and exclusively to promote the wellbeing of needy or suffering others (Batson et al., 2008), and rather speak of prosociality when indirect benefits of the act to the self may arise later from interactive system dynamics; e.g., Grant & Berg, 2012, for organizational settings. Evolutionary theories see long-term effects of altruism as key to group

selection (Wilson, 2015) and gene-culture coevolution (Gintis, 2011). From these perspectives, what counts as “benefit to all” is not a feature of the immediate act, but depends on the temporal and contextual focus of the observer.

In fact, it is not hard to see in present times how the distribution of altruistic traits among humans may influence evolutionary dynamics. Some of the most pressing global problems, including mass migration, worldwide epidemics, and climate change (Böhm et al., 2018; Luo et al., 2021; Van Lange et al., 2018) impose costs on societies, communities, and individuals in order to save and protect unknown strangers, distant populations, and future generations. To meet these challenges, “prosociality” may not be selfless enough, and “good” intentions may not suffice unless they result in consequential actions. The crucial question in these contexts is rather whether and to what degree members of a group or society are prepared to perform costly acts that benefit others more than themselves. To advance and aid the relevant research, the present study is devoted to constructing a measurement tool that can be used to measure behaviorally defined altruistic traits efficiently.

The Facets of Altruistic Behaviors

The research on altruism is multidisciplinary and diverse, and various facets of altruistic behaviors have been described. In the psychological literature, altruistic behavior has most often been equated with *help-giving* (Batson, 2010; Batson et al., 1981; Cialdini et al., 1997; Rushton et al., 1981), also termed *altruistic rewarding* in other domains (Fehr & Fischbacher, 2003). This means *sharing* one’s resources with needy or deserving others, be it time, money, goods, energy, information, cognitive resources, or even blood and internal organs. In extreme cases, the behavior may imply risking one’s life to save that of another (Rand & Epstein, 2014).

In recent years, however, two other facets of altruism have emerged in the literature that appear systematically distinct from the kind of caring and other-befriending behaviors that exemplify helping and sharing. Specifically, these are socially antagonistic and confrontational types whose main characteristics is to oppose against fairness violations and moral transgressions (Fehr & Gächter, 2002;

Halmburger et al., 2017; Pfattheicher & Keller, 2017). Though less agreeable than helping, the two behavioral types are nonetheless altruistic in that they are costly and risky for the actor/s while establishing or defending norms and virtues of the community or society, hence providing a benefit for all. It is essential to consider such remedial forces in the assessment of altruism because these reduce and prevent the exploitation, withdrawal, and ultimately extinction of help-giving traits within groups (e.g., Fehr & Gächter, 2002; Wilson, 2015).

Two research strains have developed with only very little crosstalk between them. The first is concerned with *moral courage*. This represents the willingness to defend ethical values against social threats, typically against a social power gradient, thereby putting one's own social status and personal well-being at risk (Bronstein et al., 2007; Halmburger et al., 2015; Jonas & Brandstatter, 2004; Niesta Kayser et al., 2010). Like helping, moral courage is selfless, but unlike helping, it opposes wrongdoing instead of compensating or strengthening specific individuals. Notably, the two behaviors are conflated when one of the most efficient ways by which a victimized individual can be helped is by confronting their perpetrator/s, a situation that is described in many items of the Munich Civil Courage Instrument (Kastenmüller et al., 2007); for instance, when a parent hits their 3 year-old child. In fact, this type of conflation is inherent to all kinds of bystander interventions, situations in which the independent observer of a crime or misconduct helps the affected victim/s through interference (Baumert et al., 2013a; Darley & Latané, 1968; Fischer et al., 2011). To decontaminate the term moral courage, we propose not to reserve it for reactions against observed offenses targeted at a specific (group of) individual/s. Instead, we would relate it more generally to the pursuit of one's moral values (civil democratic values in the case of *civil courage*), both reactively and proactively, through opposition against powerful social forces (Halmburger et al., 2015; Landmann & Hess, 2017).

The second form of confrontational altruism, termed *costly peer punishment*, has emerged from economic game settings. Players are given the opportunity to pay for the punishment of unfair other players who have refused to contribute their fair share to an investment game but nonetheless

accept equal payoffs. Experimental studies have established that costly punishment effectively increases group cooperation by deterring such free riding, so that all players collectively benefit from the punishment while the punisher themselves carries the net costs (Fehr & Fischbacher, 2004; Fehr & Gächter, 2002). The phenomenon is termed *second party punishment* when it occurs between interacting peers, and *third party punishment* when the punisher is merely a bystander who has passively observed the unfair play (Fehr & Fischbacher, 2004). Both these forms appear to show little or no correlation with voluntary sharing (helping) as assessed by the Dictator Game (Supplementary Tables 1 to 3 in Peysakhovich et al., 2014, but note that Pearson correlations were used even though data distributions from the Dictator Game are usually not unimodal and symmetric (Engel, 2011), leading to potential bias in these estimates (Bishara & Hittner, 2015)).

One drawback of peer punishment emerges when the punishment is not efficient enough, meaning it is too costly relative to the group benefit, and thus reduces the overall payoff of the group (Dreber et al., 2008; Fehr & Rockenbach, 2003). Additionally, the punishment entails the risk of retaliation, which can spiral into destructive feuds and vendettas in repeated interactions (Fehl et al., 2012; Nikiforakis & Engelmann, 2011). For those reasons, players may be reluctant to choose the punishment option, letting others perform the punishment, and giving rise to a “second-order” free riding problem (Boyd et al., 2003; Perc, 2012). In view of these problems, some scholars have questioned whether costly punishment among peers actually exists in the real world, outside the imperative lab setting (Guala, 2010). Many, however, believe in coordinated forms, where punishment power is shared or centralized (Boyd et al., 2010; Gross et al., 2016; Molleman et al., 2019; Wu et al., 2016). For the coordination process, gossip is thought to play an important role (Feinberg et al., 2014; Wu et al., 2016). Overall, it seems reasonable to conclude that individuals can engage informally in peer punishment by coordinating group activities against unfair group members. Netto costs would be highest for the initiating individual, yet their act would serve the welfare of the group by effectively deterring free-riding, thereby increasing and stabilizing cooperation levels.

According to our knowledge, no prior study has systematically addressed the question of whether costly peer punishment can be distinguished, conceptually and empirically, from moral courage (but see Kinnunen et al., 2015; Kinnunen & Windmann, 2013). Both are confrontational, antagonistic behaviors that satisfy the behavioral definition of (at least weak) altruism. One crucial difference between the two, however, is that peer punishment serves to defend established norms, in accord with the values of the reference group, whereas moral courage, as defined here, may undermine or even challenge such norms by questioning the “rules of the game”, as it were, thereby offering innovative and transformative potential for the system as a whole. Second, with its rooting in experimental game settings, and the expected peer group’s backup, peer punishment entails rather circumscribed risks, at least under anonymous and one-shot conditions, whereas moral courage bears unpredictable and potentially immense threats. At the extreme, the consequences can even be fatal as in the historical cases of Martin Luther King or Mahatma Gandhi, individuals who were by no means concerned with punishing peers, but proactively pursued a moral mission. Acts of moral courage are frank, visible, direct, and personal, whereas peer punishment can be hidden, indirect, and secret, while nonetheless satisfying our definition of (weak) altruism for as long as it incurs net costs for the actor. A third difference is that peer punishment, by definition, describes interactions among peers who are at the same level of the social hierarchy, whereas moral courage operates against a power gradient by challenging authorities or majorities who have the means to respond with directed retaliation and repercussion. An ultimate example is the prominent and exceptional case of Edward Snowden who opposed against practices of the highest levels of governmental administration, leading to his relentless persecution and factual ostracism. In fact, whistleblowing in opposition against authorities, supervisors, or the majority’s interests is prototypical for morally courageous acts, if done personally (Dungan et al., 2019; Waytz et al., 2013).

To summarize, the literature has characterized three facets of altruism which we think may be conceptualized as distinct factors at the behavioral level: Help-giving (HG), moral courage (MC), and

peer punishment (PP). The goal of the studies reported in this article is to construct a self-report questionnaire that can be used to reliably measure these three traits with high efficiency.

Item construction and item selection using Ant Colony Optimization procedures

We designed a German self-report questionnaire aimed at assessing the three facets of altruistic behavioral (FAB) traits: help-giving (HG), moral courage (MC), and costly peer punishment (PP). We proceeded as preregistered at <https://osf.io/2buh6>.

The items of the scale were constructed as follows. First, each item was formulated to represent one of the three altruistic facets (see ESM section 1.1), with larger conceptual variation between the components than within. Second, all items referred to actual behaviors (as opposed to values and attitudes) as much as possible, thereby reducing social desirability biases, and maximizing predictive validity. Some items asked in subjunctive for the willingness to perform a behavior (i.e., risking one's life to save someone else's) because the described action is highly indicative, albeit rare. Third, not all items contained all elements of the complex behavioral facets to the same degree. Their focus varied somewhat to allow for natural variation and non-suggestive phrasing.

In total, 57 items were constructed (listed in Table ESM_1 in section ESM 1.2). Subsequently, the process of item selection for the three subscales was performed, first, via classical procedures, and second, using the *stuart* approach (Schultze, 2017; Schultze & Eid, 2018) which treats the item selection procedure as a combinatorial problem (specifically, as an *I*-dimensional multiple knapsack problem with assignment restrictions). Ant Colony Optimization (ACO) was used as described by Schultze (2017). Its approximative approach allows to achieve almost optimal solutions at relatively low computational costs (Dorigo & Stützle, 2010).

Details of the procedure are as follows: Item selection is performed iteratively. Initially, sets of items are drawn randomly from the item pool to form multiple possible solutions. Using confirmatory factor analysis (CFA), the psychometric quality of each of these solutions is evaluated with regards to a number of predefined criteria (e.g., model fit, reliability, and latent correlative structure). All items

used in a solution are then rewarded for their participation in good solutions by depositing the quality of these solutions on the so-called pheromone. This pheromone is used to weigh the probability of an item being selected in the next iteration, where it is again updated in line with the quality of solutions this item was a part of. As the number of iterations increases, the pattern becomes clearer, leading to an efficient (but not necessarily optimal) solution (Schroeders et al., 2016).

The advantage of ACO is that it allows researchers to define the desired characteristics of their scale in terms of factorial structure, goodness-of-fit, and numbers of items. For short-scale development this has been shown to outperform classical approaches (Janssen et al., 2017; Leite et al., 2008) due to its computational efficiency and ability to optimize multiple criteria simultaneously (Olaru et al., 2018). Additionally, it provides an automated and reproducible procedure that is much less reliant on individual decisions than manual selection of items.

After primary scale construction, we validated the selection in a second sample (Study 2). Finally, we add information from a pilot study on the criterion validity of the final scale (Study 3).

All data and scripts are available at

https://osf.io/jvp84/?view_only=ef93c7f4497b487483abae2fbb998e25.

Study 1

We presented the full item pool to participants and then performed item selection both via classical analyses and via ACO procedures. We also presented seven items about civil courage (CC), to ensure (in our western culture sample) that MC items are being interpreted as defense of ethical (not egoistic) values, presuming that most of our participants would hold civil-democratic values. In sum, 64 items were presented.

Methods

Participants. The sample consisted of 381 German speaking participants, mean age 43.0 years ($SD = 13.2$; range: 18-70), 52% female. In total, 413 participants had been recruited through a

commercial panelist and received approximately €2.50 for online participation. The sample was quoted in terms of age, gender, and education. In line with the preregistration, we excluded participants who completed the survey in less than 5 minutes (32 participants). No participants had to be excluded for low survey motivation or poor understanding of the items as assessed by the five motivational statements in the survey.

Materials. All 64 items on altruistic behavioral traits and CC were rated on a six-point scale labelled 1 = *strongly disagree*, 2 = *disagree*, 3 = *rather disagree*, 4 = *rather agree*, 5 = *agree*, and 6 = *strongly agree*. To ensure participants' engagement, two control questions were included asking the participant to check a predefined answer option. Incorrect responding led to immediate abort.

Regarding CC, seven items were constructed that describe behaviors by which civil democratic values (human rights according to the UN charta) are vigorously defended. Only the five best items based on item-scale correlations and factor loadings were used (see ESM section 1.4 and note that *bruteforce* from the *stuart* package selected the same five items). McDonalds ω for the five CC items was .84.

The short German *Kurzskala für soziale Erwünschtheit-Gamma* (KSE-G; Kemper et al., 2012) was used with a 6-point response scale. It measures social desirability as the tendency to give a positive description of oneself and understate negative qualities by six items in total.

A set of five motivational statements dealt with how difficult it was to answer the questions and how much effort the participants had put into answering them. With one item each, living conditions in terms of financial resources, free time and social responsibilities (e.g., custody for a child) as well as voting preferences were taken for exploratory reasons (not considered further).

Procedure. The online survey (implemented in Unipark EFS Survey, Version 18.4, 2018, Questback GmbH) started with the items presented in randomized order, intermixed with items of the KSE-G and the two control questions. Thereafter, participants were asked to rate their survey motivation and living conditions and indicate demographic information (ESM section 1.5). On average,

answering the entire survey took 13 minutes.

Statistical Analyses. Item selection was performed with the *Max-Min-Ant-System*, MMAS, algorithm (Stützle, 1998) implemented in the *stuart* package, Version 0.7.3 (Schultze, 2018) for R, Version 3.6.0 (R Core Team, 2019). For the CFA, we defined a three-factorial model with no cross-loadings and five items for each factor.

We included model fit as well as a reliability criteria in the objective function that determines the quality of a solution. Regarding model fit, we took into account both the incremental fit index CFI (Bentler, 1990) and the absolute fit index RMSEA (Steiger, 1980). We used logistic functions of CFI and RMSEA in line with the recommendations made by Schultze and Eid (2018) to ensure theoretical bounds on the objective functions as well as to allow for an increased degree of discrimination between solutions close to traditional cut-off values for these fit criteria.

$$\varphi_{CFI} = \frac{1}{1 + e^{-100 * (CFI - 95)}} \quad (1)$$

$$\varphi_{RMSEA} = 1 - \frac{1}{1 + e^{-100 * (RMSEA - .06)}} \quad (2)$$

Additionally, we included a SEM-specific measure of reliability as proposed by Yang and Green (2010) to ensure that the scale measures the constructs as reliably as possible. In this case, the reliability measure is identical to McDonald's ω (McDonald, 1999). We used the lowest of the three facet-specific reliabilities in the objective function in the following fashion:

$$\varphi_{rel} = \frac{1}{1 + e^{-10 * (\min(rel) - .7)}} \quad (3)$$

In order to consider model fit and reliability equally when determining the quality of a solution, pheromone contributions were combined to the following optimization function with theoretical limits from 0.001 to 1.955:

$$\varphi_{overall} = \frac{\varphi_{CFI} + \varphi_{RMSEA}}{2} + \varphi_{Rel} \quad (4)$$

All parameters required for the MMAS algorithm were set according to the recommendations

of Schultze (2017). The measurement models generated by the algorithm were estimated using lavaan, Version 0.6-3 (Rosseel, 2012) with their parameters being estimated using MLM in order to deal with violations of normality.

Results

Primary analyses without the ACO procedure are reported briefly here as preregistered at <https://osf.io/2buh6>. (Note that we changed the label “AP” (for “Altruistic Punishment”) in the preregistration to “PP” (for “Peer Punishment”) in this article as PP refers more specifically to group-coordinating activities, whether or not these are altruistically motivated).

“1. Classical test-theoretical item analysis based on item characteristics (proportions)” in combination with “5. exploratory factor analysis with direct oblimin rotation” (see ESM section 1.2). In brief, this analysis suggested a 3-factorial solution interpreted as MC, PP, and HG, with goodness-of fit indices indices of $\chi^2 (627) = 1410.25, p < .001, RMSEA = .057, SRMR = .047, CFI = .840$; the last one not fulfilling the criterion set for acceptable model fit in the preregistration. Misfit was mainly due to residual correlations between items of the same factor which were not accounted for by the 3-factorial solution. This suggests more overlap between specific items than could be captured by this model, indicating a necessity to select items which adhere to the strictly 3-dimensional structure without additional similarities of items distorting the content structure of the final scale.

“2. Exploratory Structural Equation Modeling (ESEM) with two anchor items per subscale” selected by three experts showed a three-factorial solution (see ESM section 1.3) with $RMSEA = .048, SRMR = .057, CFI = .753$ (unacceptable), which involved a number of items with cross-loadings.

3. Comparison of “the original three factor solution to a revised two-factor solution in which no AP items are predefined, and all AP items are allowed to load freely on the two other factors” (see ESM section 1.3) showed no support for the assumption of Peer Punishment collapsing into two subfactors while the three-factorial model showed acceptable fit in terms of $RMSEA (.048)$ and $SRMR (.054)$, though not in terms of $CFI (.760)$. The analysis had been done to see whether the

three-factorial model could be replaced by a two-factorial model in which PP items describing “protecting the group” load on the help-giving factor, and PP items “retaliating against fairness norm violations” load on the moral courage factor; the answer to which was clearly negative.

Since neither solution was found satisfactory, we proceeded with the **secondary analysis** (5.), performing item selection with the ACO as implemented in the stuart package for R.

Performance of the ACO selection procedure. In total, 262,448 models were calculated in 25 runs of the algorithm. Of these, a total of 201,742 solutions were unique, meaning that approximately 0.00002 % of all possible combinations were evaluated during item selection. Additionally, 36,693 solutions (13.98 %) were inadmissible due to convergence issues or non-positive-definite covariance matrices. The quality of the best solutions ranged from 1.50 to 1.59 and the best solution was found in only one run. Figure 1 shows the network of item selection frequencies, where the edges indicate how often two items were selected together across the 25 runs.

Figure 1

Network structure of the selection frequencies across the 25 runs of the item selection procedure

Note. Each node represents one item, and items that were not selected in at least one run are omitted. Node labels are white for the items that were selected in the best solution overall. Edge strength indicates the relative frequency by which the two connected items were selected together. All items were positively framed except HG12 and HG6 (which were inverted).

Of the 57 items, 26 were not selected in any run (these are omitted from Figure 1), 16 were selected in at least half of the 25 solutions, and 6 were selected in at least 23 runs. Overall, the average pairwise Jaccard distance between the 25 runs was 0.448 ($SD = 0.171$). This, in combination with the absence of disjointed clusters in the network structure, indicates homogeneity among the items assessing the same facet and speaks for a unidimensional definition of those facets. A relatively smooth search space ensued, with multiple combinations of the same group of items leading to similarly good overall scale-qualities.

Properties of the constructed scale. The overall best solution with $\phi = 1.593$ was found in one run, with 21 replications within that run. This overall best solution showed excellent model fit (RMSEA = .023, SRMR = .046, and CFI = .986) with none of the descriptive fit indices violating the cut-off criteria recommended by Hu and Bentler (1999), and the χ^2 -test not rejecting the model ($\chi^2 = 100.075$, $df = 87$, $p = .160$).

Figure 2 provides an overview over the selected items and the path model of the final solution. Composite reliability of the scale was $\omega = .853$.

Table 1 displays means, standard deviations, and bivariate correlations of the final subscales with the civil courage and the KSE-G short scale.

Figure 2

Path diagram of the measurement model of the final solution in Study 1 involving the three factors Help-Giving (HG), Moral Courage (MC), and Altruistic Peer Punishment (PP)

Note. Standardized parameter estimates are shown. No inverted items were contained in the final solution. For original item wordings in German, see Appendix.

Table 1

Correlations of the three FAB subscale scores with civil courage (CC) and the KSE-G short scale

	M	SD	HG	MC	PP	CC
HG	3.71	0.87				
MC	3.88	0.85	.41**			
PP	3.59	0.85	.20**	.42**		
CC	3.93	0.98	.61**	.62**	.41**	
KSE-G	4.34	0.74	.34**	.03	-.09	.24**

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

Discussion

The ACO produced a three-factorial model with excellent fit, contrary to classical item analysis which did not yield a satisfactory solution (see ESM section 1.2). Importantly, only the “caring” and “befriending” factor Help-Giving showed a significant correlation with social desirability (KSE-G), while the two confrontational facets did not. To conceptually replicate and extend this finding, we used another measure of interpersonal care in Study 2, namely the Inclusion of Others in Self (IOS) scale (Aron et al., 1992).

Study 2

We presented the 15-item scale constructed in Study 1 to a new sample of participants. Using multigroup confirmatory factor analysis, we investigated the degree of measurement and structural invariance of the scale across these two independent samples.

Method

Participants. 440 participants with mean age of 43.9 years ($SD = 15.0$; range: 18–74 years), 55% female, filled out the survey online as part of another study (not reported here). They were recruited by a commercial panel provider. Again, the German sample was quoted in terms of age, gender, and education. Participants gave informed consent and received € 2.20 for participation.

Materials. As part of the other study (see <https://aspredicted.org/blind.php?x=aa5wn4>, a German translation of the 15-item FWI *Free Will Inventory*, FWI, part I (Nadelhoffer et al., 2014) as well as some additional questions on religiosity and spirituality were administered to participants prior to the 15-item FAB scale and two attentional control questions. One item of the IOS was presented as a set of seven Venn-like diagrams showing two circles overlapping to different degrees. Participants were asked to choose the diagram that best describes their relationship to “other people in general”.

Procedure. The survey was implemented using Unipark EFS Survey (Version 18.4, 2018,

Questback GmbH). To ensure proper quoting, participants were asked first to indicate gender, age, and highest educational level. Next, items of the FWI were presented in randomized order, followed by the items of the FAB scale in randomized order, and the IOS item. Answering the survey took 9 minutes on average.

Statistical Analyses. Measurement invariance across both samples was tested using the forward approach (with sequential constraint imposition) in the framework of multigroup confirmatory factor analysis (Dimitrov, 2010). We compared models with increasing restrictions on equality across the samples stepwise, considering likelihood-ratio test $\Delta\chi^2$, differences in terms of CFI (ΔCFI) as well as information criteria AIC and BIC. In addition to these preregistered criteria, we also report McDonald's Centrality Index (Mc) below. Values of $\Delta\text{CFI} \geq -.01$ and $\Delta\text{Mc} \geq -.02$ indicated no substantial decrease in model fit. Again, measurement models were estimated using lavaan (Version 0.6-3; Rosseel, 2012).

Results

Analyses have been preregistered at https://aspredicted.org/blind.php?x=/RHF_JVQ. Multigroup confirmatory factor analysis was used to test for measurement invariance between the samples of Study 1 and Study 2. Table 2 displays model fit indices and model comparison criteria. The model fit of the configural model without any restrictions across samples was considered acceptable for further model comparisons with $\text{CFI} = .972$, $\text{RMSEA} = .035$, $\text{SRMR} = .046$, $\chi^2(174) = 238.550$, $p < .001$. To assess measurement invariance, we consecutively compared model fit from Model 1 (configural invariance) to Model 4 (strict invariance). As model fit did not decrease substantially regarding χ^2 and CFI, and both BIC and AIC were always smaller for the more restricted model, strict invariance of the measurement model across the two samples was assumed. The measurement properties of the FAB scale were thus reasonably equal for the two samples. Subsequently, we estimated Model 5, which tests for invariance at factor level by assuming the equality of latent means, variances and covariances across the two samples. All indicators, except for the AIC, implied a

preference for Model 5 over Model 4 ($\Delta\chi^2 = 16.608$, $\Delta df = 9$, $\Delta p = .055$, $\Delta CFI = -.003$). The model with full invariance fit the data adequately with $CFI = .966$, $RMSEA = .034$, $SRMR = .057$.

Table 2

Testing for factorial (measurement and structural) invariance across both samples

Model	$\chi^2(df)$	p	RMSEA	CFI	Mc	BIC	AIC	$\Delta\chi^2(\Delta df)$	Δp	ΔCFI	ΔMc
1: Configural	238.550 (174)	<.001	0.035	0.972	0.961	36707	36254				
2: Weak	252.156 (186)	<.001	0.034	0.971	0.960	36644	36247	13.417 (12)	.339	-.001	-.001
3: Strong	270.308 (198)	<.001	0.034	0.969	0.957	36580	36241	18.944 (12)	.090	-.002	-.003
4: Strict	286.256 (213)	<.001	0.034	0.969	0.956	36504	36236	16.442 (15)	.353	-.001	-.001
5: Full	302.481 (222)	<.001	0.034	0.966	0.952	36464	36238	16.608 (9)	.055	-.003	-.004

Note. Model comparisons were performed using the Satorra-Bentler-corrected χ^2 (Satorra & Bentler, 2001) due to the MLM estimation used to account for non-normality of the observed variables.

Means, standard deviations, and Pearson correlations of all measures used in this study are displayed in Table 3.

Table 3

Means, standard deviations, and correlations of the FAB subscales with Inclusion of Others in Self (IOS)

	M	SD	HG	MC	PP
HG	3.82	0.80			
MC	3.95	0.84	.45**		
PP	3.76	0.87	.20**	.53**	
IOS	3.59	1.59	.38**	.09	.04

*Note. * $p < .05$, ** $p < .01$, uncorrected for multiple comparisons.*

Discussion

Analyses in Study 2 fully confirmed the structure of the scale described in Study 1. In view of the excellent fit indices obtained, and their insignificant changes as we progressively increased parameter constraints, we can assume configural invariance, measurement invariance, and structural invariance between the two samples (Dimitrov, 2010). This high degree of concordance was achieved even though the FAB scale was presented in a different study context, this time after presentation of another, unrelated questionnaire, which confirms our assumption that the underlying factorial structure is robust. We conclude that the three-factorial solution depicted in Figure 1 can be generalized across samples, and, given that our two samples were quoted, may even be representative for the German population.

The IOS item showed covariation patterns similar to the KSE-G scale used in Study 1 while being less transparent. It correlated positively with the “tend to befriend” factor Help-Giving, but not with the two confrontational factors Moral Courage and Altruistic Peer Punishment. As IOS is known to correlate highly with empathy (Cialdini et al., 1997), the main proximate motivation for help-giving, the finding may be seen as a first step towards construct validation.

Study 3

In a pilot study, we examined the criterion validity of the three FAB subscales. We used economic game decisions for this purpose. Dictator Game contributions were seen as indicative for the propensity to help-give (Cornelissen et al., 2011; Engel, 2011; Epstein et al., 2016; Hilbig & Zettler, 2009; Zhao et al., 2016). Investments into punishing unfair players in a public goods game were taken as behavioral probes for peer punishment (Fehr & Gächter, 2002; Ostrom et al., 1992; Peysakhovich et al., 2014). We found no economic game in the literature that measures moral courage as defined here. What came closest is the expression of moral anger as third party observer (Baumert et al., 2013b; Halmburger et al., 2015), and behavioral opposition against ethical violations shown by a group or

authority figure (Bocchiaro et al., 2012; Niesta Kayser et al., 2010), based on which we generated a novel game scenario.

Preregistrations, materials, and data for Study 3 can be found at https://osf.io/jvp84/?view_only=ef93c7f4497b487483abae2fbb998e25.

Methods

A total of 68 participants (63% female, 0% diverse, 75% students, aged $M = 29.87$, $SD = 13.57$, range: 19-75) completed two parts of a study that involved the FAB short scale online upon recruitment, and the economic games in another online session, conducted approximately two weeks later to counter potential transfer effects. As instructions to one of the games were changed during data acquisition (see “Third Party Intervention” below), data of only 30 participants were available for that particular game.

The economic games were presented in randomized order. The games were not incentivized (no real money was paid out), but designed to appear as realistic as possible (e.g., brief pauses simulated that other players were contemplating). Participants were told up front that no real money was at stake, and that payoffs were fictitious. They were fully debriefed after the experiment that the other participants were staged in all games. In the **Dictator Game**, participants were told that they were randomly selected as winners of a reward of € 10.70. They were given two options: they could keep the money or share the amount (freely) with another participant who had not been chosen to receive a reward. In the **Public Goods Game with punishment option**, participants played in groups of four pursuing an investment project. With an initial endowment of € 5, they were asked to invest into the project. The sum of all contributions would then be tripled and distributed to all members in equal shares. Participants made investment decisions in three practice rounds. In the third practice round, they additionally had the option to punish unfair group members, i.e., free riders who did not contribute their fair share but benefited from the investments of others. Punishment would reduce other group members’ outcomes with a fee-to-fine ratio of 1:3. The fourth round was then used for

data collection.

Finally, in the spirit of a pilot study, we developed a new paradigm to observe morally courageous behavior in a clearly defined game situation which we call the **Third Party Intervention**. The logic was to determine whether participants would personally confront another player who had more power than the other players but who was behaving selfishly and spitefully. This player was introduced as being entitled to decide about the participant's own as well as the other players' payouts. Participants then observed that the person kept a large sum of € 9.40, which could have been shared with the others, then took € 11.50 from other players without justification, and indiscriminately excluded some other players from the payout. Participants were given the opportunity to send a message to this person, who would be online, but had the power to respond to the message by excluding the participants from playing and from being paid off.

After $N = 38$ data sets were collected, we found that this setup yielded larger correlations to the Peer Punishment subscale than to Moral Courage, and therefore modified some aspects to make it more distinctly reflect Moral Courage. We added the usernames of those participants who were excluded by the unfair opposer so that they sounded as if they had non-Western backgrounds, implicitly portraying them as members of minority groups. We furthermore presented the pseudonyms of other participants who could have sent a message to the offender but who had failed to do so, suggesting that the majority of the other players accepted the person's unfair behavior. We then asked participants if they wanted to send the offender a message, one that would be presented to all members of the group.

Results

As expected, the subscale Help-Giving correlated significantly with (and only with) anonymous Dictator Game giving, whereas Peer Punishment correlated significantly with (and only with) the amount of (fictitious) money spent on punishing unfair players in the Public Goods Game. Moral Courage correlated significantly (and selectively) with the decision to intervene against the offender in

the Third Party Intervention. The pattern provides preliminary evidence for convergent and divergent criterion validity of the three subscales.

Table 4. *Descriptive Statistics and Pearson Correlations for pilot validation Study 1 with N = 68*

Variable	<i>M</i>	<i>SD</i>	1. HG	2. MC	3. PP	4. DG ^a	5. TP ^{bc}
1. Help-Giving	4.07	0.68					
2. Moral Courage	4.02	0.73	.08				
3. Peer Punishment	3.43	0.96	-.04	.40**			
4. DG Giving ^a	3.79	2.63	.40**	.05	-.16		
5. TP Intervention ^{bc}	0.63	0.49	-.21	.37*	.29	-.28	
6. Punishment Costs ^a	1.44	1.58	.01	.21	.31**	.03	.26

Note. ^a Spearman correlation coefficient was calculated because of non-normal distributions.

^b Binary variable: 0 = no and 1 = yes. ^c *N* = 30. Hypothesized correlations are boldfaced.

* $p < .05$. ** $p < .01$. DG = Dictator Game, TP = Third Party.

General Discussion

The literature leaves hardly any doubt about the notion that altruism is a domain-general, stable personality trait (Hilbig et al., 2013; Peysakhovich et al., 2014; Thielmann et al., 2020). Its relevance for some of the world's most pressing problems seems undisputable (Böhm et al., 2018; Van Lange, Joireman, & Milinski, 2018). Here, we designed a questionnaire that may prove useful whenever altruism matters as a behavioral trait, not just a value, and is meant to represent more than just common kindness.

By performing item selection via ACO, we were able to generate a highly reliable and very short scale, capturing three distinct facets of altruistic behaviors (FAB) with only fifteen items. The scale's structural validity was confirmed by Study 2, which yielded full invariance.

Unlike previous altruism scales (Rodrigues et al., 2017; Rushton et al., 1981), the FAB scale not only measures help-giving (HG), but additionally integrates antagonistic facets of altruistic behaviors which serve to defend locally established fairness norms (PP) or one's own moral values (MC). In the

existing literature on these two constructs, we found only one self-report questionnaire designed to capture costly punishment (Peysakhovich et al., 2014), and one addressing moral courage as understood here (Bronstein et al., 2007). For both these scales, however, psychometric properties are not known, and the scales have apparently not been used in any other published studies. For the FAB subscales, the current study finds not only high reliability but also provides pilot information on external validity in the form of subscale-specific correlations with economic game decisions (Study 3). Convergent validity of HG was easy to corroborate by DG giving, whereas MC and PP were harder to establish, primarily because it proved difficult to design a behavioral moral courage scenario (one that is distinct from mere punishment) without putting participants at risk or deceiving them severely.

Among the subscales, MC correlated quite highly with HG in all studies, as if both reflected a genuine preference for humanitarian, benevolent acting, regardless of the dangers involved. By contrast, PP was only moderately correlated with HG (.24) in Studies 1 and 2, and practically null-correlated in the pilot study. To some researchers it may come as a surprise that the correlation was positive at all in the two larger assessments, in view of growing doubts that costly punishment is altruistically motivated (Brethel-Haurwitz et al., 2016; Rodrigues et al., 2020). After all, the act of punishment seems vengeful and hostile from a proximate viewpoint. It must be kept in mind, however, that the FAB items have intentionally been based on an effect-based definition of altruism, regardless of the underlying motives and experiences. Behavior can be egoistically motivated while being objectively altruistic and vice versa (Slote, 2013; Wilson, 1992). What counts for the objective assessment of PP is only that punishers initiate or otherwise invest into controlling and sanctioning unfair others via punitive measures without being able to request apposite reimbursement for their expenditures.

That said, we concede that peer punishment is certainly less open-minded and generous than is helping. However, it is also less costly and risky, at least the way we operationalized it. While HG items describe genuinely selfless acts mostly under anonymous conditions, of which some are

extreme, punishment behaviors are indirect, hidden, and usually backed up by the peer group.

However, considering that the correlation of MC with PP was relatively high in Studies 1 and 2 (around .50), even though only moral courage involves high risk while peer punishment does not, we suspect that it may indeed be the offensive undertone rather than the (differential) risk component that accounts for the divergence between PP and HG. At present, this must remain speculative, but the latent motives underlying the three facets of altruistic behavioral traits will be among the most interesting questions that research can address with the FAB once it has been validated more extensively.

In describing altruistic *behaviors* as opposed to values or attitudes, we expected the FAB to be relatively resistant against socially desirable responding. We found, in fact, that the correlations between FAB and KSE-G scores were non-significant for PP and MC, and only .34 for HG, suggesting that MC and PP are not considered to attract much social approval. Interestingly, the less transparent IOS item used in Study 2 showed a similar pattern: a medium-sized correlation with HG, and no significant correlation with either PP or MC. Thus, individuals with higher experienced overlap between themselves and others report more helping, but they do not report to engage more in confrontative forms of altruistic behaviors. One explanation could be that PP and MC, relative to the other-befriending HG trait, require a higher degree of autonomy and independence from others, even though all three behaviors are effectively other-concerned.

The correlational pattern of our self-designed Civil Courage (CC) scale with the FAB subscales suggest that other-orientation may be universal in HG and MC, which showed positive correlations, as opposed to ingroup-related (parochial) in PP, which did not show a significant correlation. CC was defined here as courageous acting in defense of civil-democratic values, in line with humanitarian ideals. Correlation of CC with MC depends on the proportion of democratically minded individuals in the sample. The two scales will dissociate (= not correlate significantly) in a sample of participants with non-democratic values, who will score low on CC, yet potentially high on MC. In our sample, the

correlation was .62 (theoretically .68, if corrected for the limited reliability of the two subscales) which is high, albeit in the same range as the correlation of MC with HG. This is an important result, because it defies the potential criticism that some of our MC items describe *egoistic* acts. We highlight again that the MC scale alone is oblivious to the values that are being defended. What counts is only that these values are meant to apply to all people or to society as a whole and are thus other-concerned. Put bluntly, a religious fundamentalist who is willing to fight for their ideology, while sacrificing much if not all of their wellbeing, would score high on MC, but low on CC, and may in fact be identifiable by this pattern (cf., Kossowska et al., 2018).

In research contexts, the FAB scale may prove useful in profiling altruistic traits among political, organizational, cultural, and other groups. Scientists from the domain of economic and evolutionary game theory have indeed complained about the failure of psychology to contribute valid trait measures of altruism and prosociality for large-scale assessments. For example, Henrich (2015) notes: “Disciplines like psychology, neuroscience and economics are not well equipped, either theoretically or institutionally, to deal with population-level psychological and neurological differences” (p. 86). Likewise, Epstein et al. (2016) write: “We observe that the combination of a variety of survey measures related to personality and morality, as well as a wide range of demographics, do quite poorly at predicting participants’ cooperative type” (p. 556). We hope that the FAB scale will fill this gap to facilitate the kinds of intercultural and intergenerational comparisons that can at present be performed only on the basis of expensive and intricate economic game designs (Ensminger & Henrich, 2014; Marlowe et al., 2008), while providing only binary measures in many cases, and leaving MC out entirely.

In practical regards, the FAB scale might help in the context of career counseling and task placement, after appropriate empirical testing through further research. The field of organizational psychology has long recognized that prosocial behaviors are no mere opposites to business making (e.g., Grant & Berg, 2010). High help-giving is essential for jobs providing care and support, though

burnout needs to be prevented (Zellars et al., 2000). Authentic leadership almost certainly requires high moral courage (Hannah et al., 2011). A combination of both helping and punishment preferences characterizes police service candidates (Friebel et al., 2019), and the same appears to be true for teachers (Newby, 1991).

Prior to real-world applications, however, it would be necessary to further construct-validate the subscales of the FAB scale using established personality concepts, including honesty-humility, agreeableness, and selfishness (e.g., Diebels et al., 2018). The first step into this direction is another pilot study of ours with $N = 89$ individuals in which we found a correlation of .33 with SVO (Murphy & Ackermann, 2014) and .64 with the Rushton scale (Rushton et al., 1981), see ESM section 1.6. However, it must not be forgotten that despite its focus on behaviors, the FAB scale is still a self-report scale. On the one hand, the FAB scale may be less transparent than existing scales of prosociality and altruism due to the integration of antagonistic behaviors, involving items such as “It has happened that I have affronted others due to my moral convictions”. On the other hand, it nonetheless only *describes* actions without testing for these. Future investigations will need to examine the problem of biased responding, perhaps by contrasting extreme altruists (Brethel-Haurwitz et al., 2016; Kossowska et al., 2018; Rand & Epstein, 2014) with clear-cut selfish individuals (Diebels et al., 2018; Raine & Uh, 2019).

In summary, we have shown the construction of the FAB scale using a novel algorithmic item selection approach which outperformed classical item selection procedures. The scale measures three different types of altruistic behavioral traits that are distinct, but not uncorrelated. Its structural invariance across two German samples was demonstrated. In addition to being highly consistent, the FAB is highly cost-efficient and takes only a few minutes to administer. These features make it valuable for screening purposes and large-scale assessments, in addition to individual diagnostics, after further validation and standardization.

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Appendix

Original version of the 15 selected FAB items and the five selected Civil Courage items

PP_1	Wenn sich einzelne Personen Sonderrechte herausnehmen, suche ich nach Verbündeten, um diese Person auszubremsen.
PP_8	Wenn jemand die Gemeinschaft absichtlich ausnützt, revanchiere ich mich diskret auf irgendeine Weise.
PP_12	Ich beobachte genau, ob sich jemand im Team daneben benimmt.
PP_14	Wenn sich eine Person auf Kosten meiner Gruppe Vorteile verschafft, arbeite ich im Privaten darauf hin, dass sie damit scheitert.
PP_15	Wer die geltenden Regeln zu seinen eigenen Gunsten auslegt, wird früher oder später von mir und meinen Freunden dafür zur Rechenschaft gezogen.
HG_1	In einem Zwiespalt wende ich mich lieber den Schwachen zu als den Starken.
HG_3	Ich würde durchaus mein eigenes Wohlergehen gefährden, um hungernden und kranken Menschen zu helfen.
HG_7	Trotz der Kosten für mich, unterstütze ich auch mir unbekannte Personen.
HG_10	Ich tue anderen Menschen oft ohne Vorbehalte oder Erwartungen etwas Gutes.
HG_13	In einer Notsituation würde ich wahrscheinlich spontan mein Leben riskieren, um fremde Menschen zu retten.
MC_1	Ich hinterfrage offen die Entscheidungen von Autoritäten oder Vorgesetzten.
MC_3	Es ist schon vorgekommen, dass ich Personen vor den Kopf gestoßen habe aufgrund meiner moralischen Überzeugungen.
MC_18	Wichtige Veränderungen für alle versuche ich auch gegen den erklärten Widerstand der Allgemeinheit durchzusetzen.
MC_20	Ich kämpfe gegen unrechte Anweisungen „von oben“, auch wenn es mich am Ende mehr kostet als dass es mir nützt.
MC_23	Im Konfliktfall konfrontiere ich die Täter.
CC_2	Unabhängig von meiner eigenen Position gehe ich entschieden gegen Gruppen von Menschen vor, die andersdenkenden Menschen drohen.
CC_4	Ich verteidige durch mein Handeln Demokratie und Meinungsfreiheit unter allen Umständen.
CC_5	Ich kämpfe für Menschenrechte, wenn ich diese bedroht sehe.
CC_6	Ich protestiere gegen Mehrheitsentscheidungen, wenn durch sie Freiheit und Gerechtigkeit eingeschränkt werden.
CC_7	In einer autoritären Diktatur würde ich mich trotz aller Gefahren dem Widerstand anschließen.

Note. PP = Peer Punishment, HG = Help-Giving, MC = Moral Courage, CC = Civil Courage.