

## RESEARCH ARTICLE

# Positive experiences of high arousal martial arts rituals are linked to identity fusion and costly pro-group actions

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Received: 2 June 2017

Accepted: 24 May 2018

<https://doi.org/10.1002/ejsp.2514>

**Keywords:** identity fusion, group bonding, martial arts, dysphoric arousal, ritual

## Abstract

A cross-sectional study was conducted with 605 practitioners of Brazilian Jiu Jitsu (BJJ) to test the hypothesis that high arousal rituals promote social cohesion, primarily through identity fusion. BJJ promotion rituals are rare, highly emotional ritual events that often feature gruelling belt-whipping gauntlets. We used the variation in such experiences to examine whether more gruelling rituals were associated with identity fusion and pro-group behaviour. We found no differences between those who had undergone belt-whipping and those who had not and no evidence of a correlation between pain and social cohesion. However, across the full sample we found that positive, but not negative, affective experiences of promotional rituals were associated with identity fusion and that this mediated pro-group action. These findings provide new evidence concerning the social functions of collective rituals and highlight the importance of addressing the potentially diverging subjective experiences of painful rituals.

The anthropologist Roy Rappaport declared that ‘no society is devoid of what a reasonable observer would recognize as ritual’ (1999, p. 31). Yet the rituals found across the world are extremely diverse in form and purpose and this poses a challenge for researchers who seek to address the topic. Building on cognitive research on ritual dynamics and group cognition, Whitehouse and Lanman (2014) have proposed that different types of rituals are associated with distinctive types of social bonding. Drawing on the ‘Modes of Religiosity’ theory (Whitehouse, 2000, 2004), they propose that infrequently performed, highly arousing ‘imagistic’ rituals are particularly effective at generating *identity fusion*. Identity fusion refers to a recently identified form of social bonding characterised by the simultaneous activation of personal and social identities (Gómez et al., 2011) and feelings that the individual and the group are one (Swann & Buhrmester, 2015; Swann, Gómez, Seyle, Morales, & Huiçi, 2009). Conversely, Whitehouse and Lanman propose that frequently performed, low arousal ‘doctrinal’ rituals promote categorical *group identification*, characterised by a de-emphasis on personal identity and a heightened sense of the relevant social group identity (Sedikides & Brewer, 2001; Tajfel & Turner, 1985; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). An important distinction between these two types of social bonding is that identity fusion is built from personalised relational bonds directed at other group members and then projected onto groups, whereas group

identification derives from processes of categorical affiliation with group collectives and depersonalisation (Rosenberg, 1987).

A series of studies have demonstrated that the two constructs possess both convergent and discriminant validity, with fusion found to be a stronger predictor for pro-group acts, including lifelong group loyalty (Newson, Buhrmester, & Whitehouse, 2016), and personally costly, pro-group behaviours than unidimensional measures of group identification (Buhrmester, Fraser, Lanman, Whitehouse, & Swann, 2014; Gómez et al., 2011; Jimenez et al., 2015; Swann, Gómez, Dovidio, Hart, & Jetten, 2010; Swann et al., 2009; Whitehouse, 2018). Accordingly, a recent study (Bortolini, Newson, Natividade, Vázquez, & Gómez, 2018) that directly compared the predictive power of identity fusion measures with unidimensional and multidimensional measures of group identification (Leach et al., 2008) found that fusion accounted for additional variance in the endorsement of pro-group acts across three different group contexts: nationality, religion, and football fandom.

## Rituals and Group Bonding

Social theorists have long suggested that collective rituals are a means of producing social cohesion (Durkheim, 1912; Khaldun, 1958; Robertson-Smith, 1889). In particular, painful or frightening ritual ordeals, such

as military hazing or tribal initiations, have been linked to especially intense group bonding (Barth, 1975; Turner, 1969; Whitehouse, 1996; Whitehouse & Lanman, 2014; Whitehouse & McQuinn, 2012).

Yet despite the long history of theories on ritual and social cohesion there has been a relatively limited amount of empirical research directly examining how participation in rituals impacts group affiliation. An often cited exception is Aronson and Mills' (1959) classic study on group initiations, which demonstrated that the relative severity of initiation experiences influenced how positively individuals rated their group, with more severe experiences leading to increased liking. The level of severity was manipulated in Aronson and Mills' study by having participants read a list of embarrassing sexually explicit words and extracts. Follow-up studies replicated the effect with other forms of psychological discomfort (Keating *et al.*, 2005, Study 3), painful electric shocks (Gerard & Mathewson, 1966), drawing blood, vomiting and inducing injury (Winslow, 1999). However, there have also been studies that have reported ambivalent or null results (Hautaluoma & Spungin, 1974; Kamau, 2013; Lodewijckx & Syroit, 1997; Van Raalte, Cornelius, Linder, & Brewer, 2007).

Insofar as the effects are judged reliable, the findings offer broad support for a cognitive dissonance (Festinger, 1962) account for how unpleasant initiations generate bonding: cognitive dissonance theory suggests that individuals will be motivated to achieve psychological consistency following the performance of unpleasant activities, by justifying their efforts to themselves. People who have experienced a harsh initiation to join a group should thus make a more positive assessment of the group involved and its members, regardless of the group's true value.

Aldo Cimino (2011, 2013) argues that such accounts provide only a partial explanation, as they fail to explain why ritual trials (also referred to as 'hazing')—if they increase cohesion—are not regularly repeated. Or they fail to account for why such rituals almost always involve senior members inflicting the challenges on newcomers. To better address these issues he offers an alternative—Automatic Accrual Theory—developed from an analysis of ethnographic reports of ritual hazing (Strathern, 1970; Young, 1965), self-reported surveys of hazing experiences (Cimino, 2011, 2013), and vignette experiments that ask participants to design initiations for different types of groups (Cimino, 2013). Building on this evidence, Cimino proposes that costly initiation rituals are an important evolutionary strategy that enables groups with higher status or greater access to resources to weed out potential free riders. Additionally, harsh initiations can serve as an advertisement to potential members of the high status and desirable nature of the group through demonstrating the hardship that potential members are willing to endure in order to join. Cimino suggests that the importance of such a mechanism over evolutionary history has resulted in human minds

possessing 'psychological mechanisms that motivate the strategic devaluation of coalition newcomers' (2013, p. 447).

This is a strong claim that Cimino recognises requires further evidence to validate, but his proposal accords with other recent research that discusses the ability of costly rituals to serve as a reliable and trustworthy 'signal' of commitment to a group and its members (Bulbulia, 2004; Bulbulia & Sosis, 2011; Cimino, 2011; Sosis & Alcorta, 2003). A prominent advocate of this approach is Henrich (2009), who suggests that rituals, particularly those that involve significant physical or material costs, should be understood as a type of 'credibility enhancing display' (CRED) that enables cultural learners to better identify reliable cultural models. Mathematical evolutionary models provided preliminary evidence in support of this hypothesis (Henrich, 2009) but more recently two independent studies have provided real world empirical evidence (Lanman & Buhrmester, 2017; Willard & Cingl, 2017). Specifically, the studies found that individuals' exposure to religious CREDs, including parents attending ritual events, such as Catholic mass services, predicted subsequent endorsement of theism and supernatural beliefs in samples collected in America (Lanman & Buhrmester, 2017), the Czech Republic, and Slovakia (Willard & Cingl, 2017).

Alongside survey-based studies, there has also been a raft of field studies conducted during actual ritual events. Dimitris Xygalatas and colleagues conducted a series of field studies examining different extreme ritual events performed in Greece (Xygalatas, 2012), Spain (Bulbulia *et al.*, 2013; Konvalinka *et al.*, 2011), and Mauritius (Fischer *et al.*, 2014; Xygalatas, Mitkidis, *et al.*, 2013). These studies have provided evidence that, among related observers and performers, physiological arousal in extreme rituals is synchronised (Konvalinka *et al.*, 2011) and that attendance at such events is accompanied by an increase in pro-group behaviour as compared with rates observed following less costly rituals, among both performers and observers (Xygalatas, Mitkidis, *et al.*, 2013). However, other studies have also found evidence for important differences between observers and performers. Fischer *et al.* (2014) report contrasting affective responses between observers and performers of a fire walking ritual and Mitkidis *et al.* (2017) found that voluntary moral behaviour increased in a post-ritual period only for observers not for performers.

Recent experimental work has also provided corresponding evidence that performing simple novel rituals can increase group affiliation (Wen, Herrmann, & Legare, 2016) and may encourage intergroup bias (Hobson, Schroeder, Risen, Xygalatas, & Inzlicht, 2017), as such actions are interpreted as socially normative and informative (Kapitány & Nielsen, 2015). Additionally, studies examining collective experiences of pain have found that people report feeling more bonded and behave more cooperatively with other group members after experiencing painful tasks than

when they perform non-painful versions of the same tasks (Bastian, Jetten, & Ferris, 2014).

The recent flurry of research on rituals and their role in social bonding is a positive development, but it should be emphasised that at this point many of the findings are preliminary and are drawn from a small number of research groups. Most findings are thus in need of further independent replication. Furthermore, there has to date been only a limited amount of attention to the precise psychological mechanisms proposed to be underlying the bonding and pro-group behaviour observed (see Hobson *et al.*, 2017, for a summary).

### Identity Fusion and High Arousal Rituals

As noted above, Whitehouse and Lanman (2014) have recently presented a provocative theoretical framework that proposes that categorical group identification processes are more strongly associated with frequently repeated, low arousal rituals and that, conversely, high arousal ritual experiences may serve as 'particularly compelling sources of [identity] fusion' (Swann *et al.*, 2012, p. 450).

Preliminary support for these hypothesised relationships primarily comes from studies that have demonstrated connections between high arousal experiences and higher reported levels of identity fusion with relevant groups. Two independent studies, for example, have reported that individuals who have shared highly arousing negative experiences, such as frontline combat during the Libyan civil war (Whitehouse, McQuinn, Buhrmester, & Swann, 2014) and experiences of violence during the conflict in Northern Ireland (Jong, Whitehouse, Kavanagh, & Lane, 2015), display higher levels of identity fusion with relevant group identities. Similarly, a study conducted with British football fans reported that feelings of having been personally shaped by crucial group events—both positive and negative—were associated with greater levels of fusion with the teams (Newson *et al.*, 2016). Finally, a recent multi-methods paper has offered converging evidence from an evolutionary mathematical model and a series of correlational and experimental studies that sharing painful experiences is associated with greater willingness to sacrifice for the group and that this relationship is mediated by identity fusion (Whitehouse *et al.*, 2017).

Collectively, these studies provide evidence for a link between high arousal experiences and identity fusion with related groups, but they do not explicitly examine *ritual* experiences and therefore cannot speak to any specific relationship between ritual and identity fusion. Furthermore, with the exception of Newson *et al.* (2016) almost all studies to date have focused on negatively valenced experiences. This is likely due to Modes theory deriving from ethnographic research focusing on traumatic Melanesian 'rites of terror' (Whitehouse, 1996), evidence of a stronger inverse relationship between negative arousal and ritual

frequency in a ritual coding study (Atkinson & Whitehouse, 2011), and traumatic experiences being both highly memorable and more reliably associated with high arousal (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). Yet the findings of Newson *et al.* (2016) indicate that it would be premature to conclude that high arousal 'euphoric rituals could not have similar effects' to comparable negative rituals, a point raised by Xygalatas (2014, p. 689).

Additional evidence for the importance of examining the potential relationship between positive experiences at collective rituals and identity fusion has been provided by two recent studies conducted in quasi-ritual contexts—folkloric marches and drumming festivals in Spain. Páez, Rimé, Basabe, Włodarczyk, and Zumeta (2015) found that participating in both positively valenced (folkloric marches) and negatively valenced (protest demonstrations) collective gatherings strengthened identity fusion with relevant groups. Zumeta, Basabe, Włodarczyk, Bobowik, and Páez (2016) similarly found that greater levels of involvement with collective drum marches were associated with increases in levels of identity fusion, a relationship which was mediated by perceptions of shared flow.

Taken collectively, findings to date offer some general support for the ritual and group cohesion framework outlined in Whitehouse and Lanman (2014); however, as neither study included comparable measures of group identification, it is impossible to discern whether the effects observed are specific to identity fusion or would be replicated with alternative group affiliation measures.

### Current Study

The current study seeks to contribute to the ongoing efforts to empirically examine the effects of ritual participation, in particular, by providing a direct test of the hypothesised positive association between high arousal rituals and identity fusion. Whitehouse and Lanman (2014) emphasise that this relationship should be stronger than that observed between high arousal rituals and categorical group identification. Hence, the current study seeks to explicitly compare the strength of these relationships and explore how it interacts with positive and negatively valenced experiences. Additionally, the study intends to provide novel evidence to examine recent claims that socially shared experiences of pain can enhance group bonds and pro-group cooperation (Bastian *et al.*, 2014; Fischer & Xygalatas, 2014; Olivola & Shafir, 2013) and predictions from Automatic Accrual theory (Cimino, 2011, 2013) concerning an association between group status and the severity of group rituals. Addressing these outstanding issues is also intended to help identify the psychological mechanisms promoting the elevated pro-group behaviour recorded post-ritual in recent studies (Fischer, Callander, Reddish, & Bulbulia, 2013; Mitkidis *et al.*, 2017; Xygalatas, Mitkidis, *et al.*, 2013).

The data collected to enable such tests are responses to an online survey about experiences of ritualised promotion events within a community of Brazilian Jiu Jitsu (BJJ) martial arts practitioners. Brazilian Jiu Jitsu is a grappling martial art derived from Judo that is usually practised in small groups of between 10 and 50 members. BJJ practitioners were specifically selected for this study because their training system involves ritualised rank promotion events that are rare (typically occurring only a few times during a practitioner's training career), personally consequential, and vary significantly in terms of how arousing and physically stressful they are. This variation is primarily due to BJJ promotional events often, but not always, involving painful *belt-whipping gauntlets*. These gauntlets involve the individual being promoted walking past a line of their training partners, who stand shoulder-to-shoulder and use their untied belts to whip the individual being promoted, which often results in severe welts and bruising (Figure 1). The practice remains a controversial topic amongst BJJ practitioners (Huni, 2014), with some schools banning the practice outright.

Another benefit of exploring BJJ promotional rituals is that although they often involve objectively painful ritualised elements, they are also intrinsically positive events that celebrate achievement and progression in skill. This results in an intriguing affective ambiguity that is common within the category of rituals referred to as 'rites of passage' (Van Gennep, 1960). Rites of passage often involve challenges or feats of endurance and thus it is likely that the patterns observed with BJJ promotion events could be applicable to other similar ritual contexts.

### Hypotheses

The hypotheses that the current study addresses are:

H1: Individuals who experience more affectively arousing ritual promotions will report higher levels of identity fusion with their BJJ school (Swann *et al.*, 2012; Whitehouse & Lanman, 2014; Whitehouse *et al.*, 2017).

H2: (A) There will be a stronger relationship observed between reported affective arousal at ritual promotions and identity fusion with the relevant BJJ school than with group identification measures (Whitehouse & Lanman, 2014).

(B) Negatively valenced affective arousal will display a stronger association with identity fusion than comparable positively valenced affective arousal (Whitehouse & Lanman, 2014; Whitehouse *et al.*, 2017).

H3: More painful promotional experiences will be positively associated with (A) stronger perceived social bonds (Bastian *et al.*, 2014; Olivola & Shafir, 2013) and (B) increases in costly pro-group sacrifices (Xygalatas, Mitkidis, *et al.*, 2013).

H4: Individuals reporting more negative promotional experiences will rate their groups as being of higher status (Cimino, 2011, 2013).

H5 (Confirmatory): Identity fusion will better predict costly pro-group sacrifices than group identification (Gómez *et al.*, 2011; Swann *et al.*, 2009, 2014).

### Method

#### Ethics

The data collected from respondents was stored anonymously and all participants were provided with study information and required to complete a consent sheet. All procedures for the study complied with the regulations of the School of Anthropology and Museum Ethnography Research Ethics Committee (Oxford University) and received approval (Ref No: SAME/CUREC1A/12-28).

#### Data Archiving

The data used in all analyses reported in the manuscript are available to access on the Open Science



**Fig. 1:** A belt-whipping gauntlet (left) and resulting bruises and welts (right). Images used with permission of Alessandro Vini and *BJJ Eastern Europe*

Framework (<https://osf.io/fw9sk/>) with all identifying information removed.

## Participants

Participants were recruited over a six-week period via notices posted online on popular English-language BJJ forums, message boards, and through word of mouth. An interview conducted for the *fightworks* podcast (<https://thefightworkspodcast.com/>) helped to stimulate interest in the study, as did independent reposting of the study on the BJJ subforum of reddit.com. A dedicated website was also established to help promote and provide information about the study ([www.bjjsurvey.com](http://www.bjjsurvey.com)). Following the recommendations of Fritz and MacKinnon (2007), the effect sizes reported in the most comparable study to date (Newson *et al.*, 2016) were assessed and a sample size of at least  $N = 452$  was indicated as necessary for our planned analysis to have sufficient power to detect small-sized effects.

A total of  $N = 734$  completed survey responses were collected; however, from this group  $n = 66$  had no personal experience with promotion events and  $n = 63$  were low quality, mostly incomplete responses. A suspicion probe was included at the end of the questionnaire but no participants were excluded on this basis, as none identified the relevant hypotheses. After exclusions, the final sample size was  $N = 605$ . In the sample, 95.4% were male and 4.6% were female (reflective of gender distribution within BJJ more generally),<sup>1</sup> with an age range from 15 to 64 years,  $M_{\text{age}} = 31.27$  ( $SD = 7.08$ ). North Americans accounted for 60.4% of responses; Western Europeans for 14.3%, and the remaining 25.3% were widely dispersed across 31 countries. Ethnically 78.4% of the sample were Caucasian, 5.2% were Hispanic, 3.8% East Asian, 3.8% Southeast Asian, 3.6% Black or African American, and the remaining 5.2% were other or missing. For religious affiliation, 35.5% identified as Atheist, 23.2% as Agnostic, 30.6% as Christian, 3.8% as Buddhist, 1.8% as Jewish, 3.3% as Other and 1.8% as none. Eighty-two percent reported that English was their first language.

## Materials and Procedure

An online questionnaire was constructed using Qualtrics software (Qualtrics, Provo, Utah, USA) and posted online. The survey took on average 25 minutes to complete and contained a variety of questions about individuals' BJJ training and belt promotion experiences, along with questions regarding how they felt about their BJJ school, and what they would do for it. Many of the items collected in the questionnaire were focused on training experiences rather than the ritual promotional events and are thus outside the scope of

the present study. These items are not summarised below, but the full questionnaire is included for reference in the Appendix. All questionnaires were presented in English in the same format with individual items in question blocks randomised, except for the identity fusion and group identification scales due to recommendations from the scale authors.

**Positive and negative affective response.** Participants were asked to write an open-ended response describing their 'intuitions about the meaning of the BJJ belt promotion/grading ceremonies' and provide details of their 'thoughts about the overall meaning of the grading ceremonies and/or the specific elements mentioned'. Following this prompt they were then asked to rate to what extent they judged their experience to be: (1) enjoyable, (2) valuable, (3) meaningful, (4) unpleasant, (5) painful, and (6) intense. All responses were collected using 6-point scales (1 = not at all, 6 = extremely). As these were novel items, a principal component analysis (PCA) was conducted, and a two-factor solution was extracted as the best fit, with items 1–3 and 4–6 loading together. The factors were labelled as 'positive affect' (items 1–3, Cronbach's  $\alpha = .85$ ) and 'negative affect' (items 4–6, Cronbach's  $\alpha = .79$ ) in relation to experiences at belt promotion ritual events. Further detail of the PCA analysis is provided in the data preparation section.

**Identity fusion.** Identity fusion was measured using the 7-item verbal identity fusion scale (Gómez *et al.*, 2011), with the target group 'My BJJ group/school' and a 6-point response scale (1 = strongly disagree, 6 = strongly agree). The internal reliability of the scale was acceptable, Cronbach's  $\alpha = .85$ . Examples of items include: 'I am strong because of my BJJ school' and 'I'll do for my BJJ school more than any of the other members would do'.

**Group identification.** Group identification was measured using the 6-item group identification scale (Ashforth & Mael, 1989), with the target group 'My BJJ group/school' and a 6-point response scale (1 = strongly disagree, 6 = strongly agree). This identification scale was selected as it was a similar length to the identity fusion scale and was previously identified as the best competing scale at predicting extreme pro-group behaviour (Gómez *et al.*, 2011). The internal reliability of the scale was acceptable, Cronbach's  $\alpha = .79$ . Examples of items include: 'When someone criticises my BJJ school, it feels like a personal insult' and 'I am very interested in what members of other teams think about my BJJ school'.

**Relational bonds.** Three measures from Yuki (2003) that were used to measure sociometric knowledge were adapted to serve as indicators of the participants' relational bonds with members of the relevant BJJ school. The three items were as follows: 'All the members of my BJJ school are somehow personally

<sup>1</sup>Due to the small number of females in the current sample, we tested all analyses with and without female participants but no difference was found in the patterns reported.

connected to each other', 'All the members of my BJJ school are somehow personally connected to me', and 'I know the personality differences among members of my BJJ school'. Responses to all items were recorded on a 6-point response scale (1 = strongly disagree, 6 = strongly agree). A reliability analysis of the three measures revealed that the third item displayed a low corrected item-total correlation ( $r = .25$ ) and that the reliability of the combined measure was substantially improved by its exclusion (including third item,  $\alpha = .69$ ; excluding the third item, Cronbach's  $\alpha = .86$ ). As a result, in the following analyses the third item was removed from the analysis and the two remaining items were combined to provide a 'relational bonds' score.

**Group status.** Group status was measured using two items taken from Yuki (2003): 'People in other BJJ groups, generally admire my BJJ school' and 'In general my BJJ school is not respected by other BJJ groups' (reverse coded). Responses to both items were measured on a 6-point scale (1 = strongly disagree, 6 = strongly agree). However, the two items displayed only a weak correlation,  $r = .33$ ,  $p < .001$  and thus could not be combined into a reliable measure as indicated by Spearman Brown  $r = .50$  (Eisinga, Te Grotenhuis, & Pelzer, 2013). The low correlation may have been a result of the differing measurement directions introduced by the reverse coding or alternatively due to conceptual difference between being admired and being respected by others. However, as there was no clear reason to prefer either of the measures as a more relevant proxy for perceived status both items were retained but treated independently. Specifically, both items were used as independent outcomes to test Hypothesis 5 that groups employing harsher ritual promotions would be perceived by members as having higher status, as per Automatic Accrual theory (Cimino, 2013).

**Pro-group sacrifice.** Three items measured willingness to make pro-group sacrifices; two self-report loyalty items from Silver and Brewer (1997) and a behavioural monetary donation measure. The self-report items were: (Sacrifice 1) 'If my BJJ school really needed me I would be willing to donate my free time to it' and (Sacrifice 2) 'If my BJJ school were threatened, I would be willing to risk my life fighting to defend it'. Responses to both items were measured on a 6-point scale (1 = strongly disagree, 6 = strongly agree). These items displayed a relatively weak correlation,  $r_s = .40$ ,  $p < .001$ , and thus could not be combined into a reliable measure (Spearman Brown  $r = .55$ ). This result was understandable as although both measures relate to pro-group sacrifices, there are important differences in the level of severity involved.

The monetary donation measure (Sacrifice 3) was derived from responses to an opt-in task that asked participants to indicate the total amount of a £20 (approx. \$30 USD) bonus payment that they would like to donate to their school. Specifically, at the end of the

questionnaire participants were informed that five participants would be randomly selected to receive a cash payment of £20. They were then asked if they wanted to be included as a potential recipient and if so how they preferred to receive the payment if selected. The instructions also asked participants to indicate that they would like to send any portion of the bonus payment to their BJJ school. This led to a response scale that ranged from -£20 for participants who chose to keep all the money for themselves, to +£20 for participants who donated the entire amount to their school.

As all items were conceptually linked and positively correlated (Figure 2), we also examined the validity of combining all three items into a single scale, but again the reliability proved too low (Cronbach's  $\alpha = .52$ ) and, moreover, the sample size of the self-report items was substantially reduced, from  $n = 568$  to  $n = 380$ , due to the opt-in nature of the donation measure.

**Idiocentric and allocentric personality.** To help control for the variation introduced by collecting responses from a diverse multi-country sample, individual scores for horizontal and vertical idiocentric and allocentric personality traits were collected using the 16-item individualism/collectivism cross-cultural measure (IDV/COL; Triandis & Gelfand 1998). Responses to items were collected on a 6-point scale (1 = strongly disagree, 6 = strongly agree). The scale provided each participant with a four-factor score for horizontal individualism (Cronbach's  $\alpha = .60$ ), vertical individualism (Cronbach's  $\alpha = .58$ ), horizontal collectivism (Cronbach's  $\alpha = .60$ ), and vertical collectivism (Cronbach's  $\alpha = .73$ ). The reliability of the individual factors was overall moderate and was retained due to the results of a confirmatory factor analysis reported in the data preparation section. Examples of items include: 'I would rather depend on myself than others' (HI), 'Winning is everything' (VI), 'If a co-worker gets a prize, I would feel proud' (HC), and 'It is my duty to take care of my family, even when I have to sacrifice what I want' (VC).

**Training experience.** To help control for confounding variation arising from heterogeneity in experience levels, participants were asked to indicate how many hours they practised during an average week, how many years they had trained for, and their current rank (0 = white belt to 5 = black belt).

**Demographics.** Data was collected for sex, age, country of residence, nationality, ethnicity, and religious affiliation. Participants were also asked to indicate if English was their native language.

A correlation matrix of all relevant study measures is presented in Figure 2.

## Results

All analyses reported below were conducted using IBM SPSS Statistical software (Armonk, NY, USA)

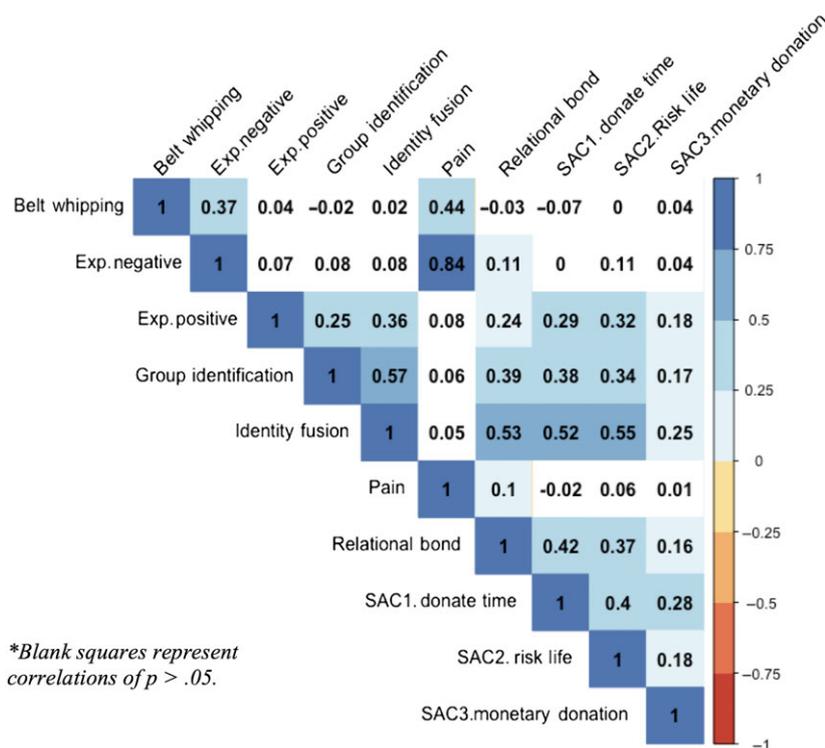


Fig. 2: Spearman’s rho correlation matrix for key study variables

(Version 25) and R Development Core Team (2017) (Version 3.4.2) running through R Studio Team (2017) (Version 1.1.383). Details of relevant packages and plug-ins are reported for each analysis. As there was no obligation for participants to complete all items in the questionnaire, the relevant sample sizes are provided for each analysis.

**Data Preparation**

The six items used to measure subjective experience of promotion events were not part of an existing scale and thus a PCA was conducted. The PCA with a varimax orthogonal rotation employed to aid interpretability identified two components that had eigenvalues greater than one, which together explained 74.24% of the total variance. The two-component solution was interpretable with strong loadings of positively valenced items on component 1 and negatively valenced items on component 2. Both components displayed good reliability, assessed using Cronbach’s alpha, when combined into scales (Table 1). Examining correlations between the combined positive and negative measures a weak non-significant positive relationship was observed,  $n = 541$ ,  $r_s = .08$ ,  $p = .08$ , implying that the measures were orthogonal constructs.

For the idiocentric and allocentric personality measures, although previous studies have provided support for the configural (Chiou, 2001) and metric equivalence of the scale in cross cultural (Li & Aksoy 2007; Gouveia, Clemente, & Espinosa, 2003; Soh & Leong, 2002) and multi-generational (Guo, Schwartz, & McCabe, 2008) samples, critical reviews have also

reported occasional low or unexpected loadings across samples (Cozma, 2011) and varying factor correlations (Oyserman, Coon, & Kimmelmeier, 2002). Therefore, a confirmatory factor analysis (CFA) was performed to assess the suitability of the standard four-factor model to the current sample. A total of  $n = 560$  participants completed the IDV/COL scale and within this sample, each of the sixteen items had less than 1% missing data. Little’s ‘Missing Completely at Random’ (MCAR) test confirmed that the missing values appeared to be randomly distributed:  $\chi^2(76) = 89.38$ ,  $p = .14$ .

Since there was a limited amount of missing values, substitute scores were calculated using an ‘expectation maximisation’ method. Specifically, values were calculated based on the scores provided for the other three items on each of the relevant subscales. A CFA using maximum likelihood estimation (MLE) revealed that

Table 1. Rotated component loadings for positive and negative experience measures

Items	Rotated factor loadings	
	Positive	Negative
Valuable	0.89	0.16
Meaningful	0.88	0.09
Enjoyable	0.83	-0.18
Painful	0.06	0.88
Unpleasant	-0.27	0.80
Intense	0.24	0.78
Eigenvalues	2.42	2.04
% of variance	40.28	33.96
Cronbach’s $\alpha$	0.85	0.75

Note: Component loadings >0.7 highlighted for emphasis.

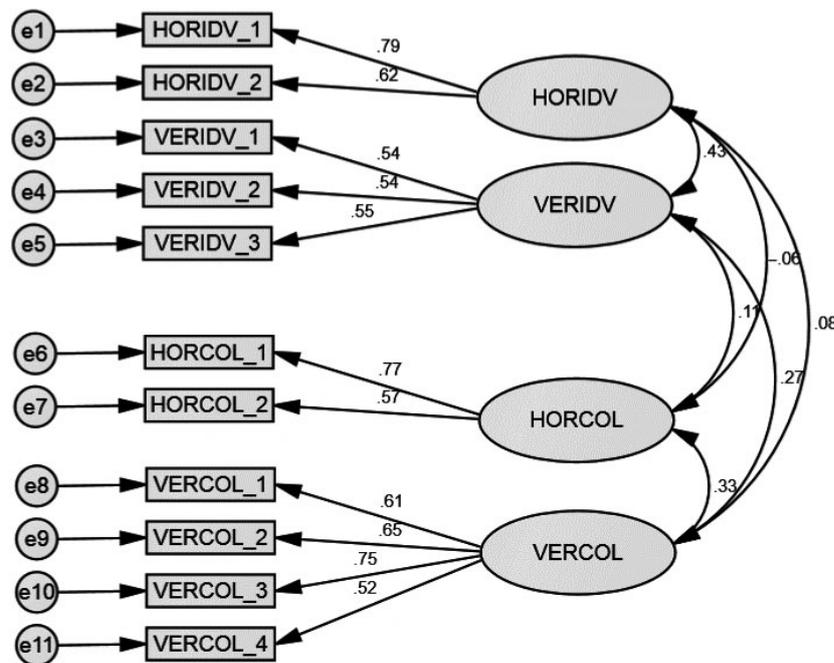


Fig. 3. Four factor structure of IDV/COL scale

the initial factor loading for the expected four-factor model had unacceptably low loadings for four items: HORIDV3 ( $r = .41$ ), HORIDV4 ( $r = .28$ ), VERIDV4 ( $r = .40$ ) and HORCOL3 ( $r = .36$ ). These items were excluded and the analysis re-run. In the reduced model, only one more item, HORCOL4, displayed a low loading value ( $r = .47$ ) and so it too was excluded. The final model retained eleven of the sixteen original items, all of which loaded onto their respective factors with a correlation of  $r < .5$  (Figure 3). Modification indices identified no items that could be co-varied in accordance with the latent factor structure and so no further changes were made. Using this model, goodness of fit indices indicated an acceptable model fit: GFI = .98, AGFI = .96, CFI = .95, RMSEA = .05, SRMR = .06. The reliability of the four sub-scales, as assessed by Cronbach's alpha, was moderate (Table 2).

### Hypothesis 1: More Affectively Arousing Belt Promotion Rituals Will be Associated with Higher Levels of Identity Fusion

To test Hypothesis 1, we first conducted a simple comparison for average identity fusion scores between practitioners who had undergone promotional events that featured a belt-whipping gauntlet and those who had not. We reasoned that promotions with belt-whipping gauntlets would be more physiologically and mentally challenging for participants and that sharing such experiences collectively has been hypothesised as fertile ground for promoting identity fusion. From the total sample, 52.9% reported enduring belt-whipping gauntlets as part of their belt promotion ritual events, resulting in two similarly sized comparison groups:  $n = 320$  belt-whipping,  $n = 285$  no belt-whipping.

Prior to conducting the main comparison on fusion scores, the two groups were compared for differences on potentially confounding demographic and training experiences, but no significant differences were found for age, sex-ratio, average hours training per week, total years training, or average belt ranking. The groups did display differences on the negative affect measure, with those with belt-whipping experiences reporting higher scores than respondents with non-belt-whipping promotions:  $M_{\text{Belt Whip}} = 2.65$  ( $SD = 1.16$ ) versus  $M_{\text{No Whip}} = 1.87$  ( $SD = 1.07$ ),  $t(556) = 8.19$ ,  $p < .001$ ,  $d = 0.69$ . The two groups did not differ on the positive affect measure:  $M_{\text{Belt Whip}} = 4.84$  ( $SD = 1.12$ ) versus  $M_{\text{No Whip}} = 4.73$  ( $SD = 1.19$ ),  $t(561) = 1.24$ ,  $p = .21$ . Comparing negative to positive affect scores within

Table 2. Summary of study variables

Variable	N	Items	M (SD)	$\alpha$
(1) Positive experience	563	3	4.79 (1.15)	.85
(2) Negative experience	558	3	2.28 (1.18)	.79
(3) Identity fusion	563	7	3.83 (1.10)	.89
(4) Group identification	569	6	4.28 (0.93)	.79
(5) Relational bonds	565	2	3.94 (1.13)	.86
(6) Group status—Admired	567	1	4.34 (1.00)	—
(7) Group status—Respect	568	1	5.11 (1.05)	—
(8) Sacrifice 1—Give time	570	1	5.05 (1.01)	—
(9) Sacrifice 2—Risk life	568	1	2.57 (1.59)	—
(10) Sacrifice 3—Donate money	382	1	-6.89 (17.56)	—
(11) Horizontal individualism	560	3	4.70 (0.68)	.60
(12) Vertical individualism	555	2	3.58 (0.84)	.58
(13) Horizontal collectivism	561	3	4.53 (0.66)	.60
(14) Vertical collectivism	559	4	4.23 (0.96)	.73

Note: All items measured on 6-point response scale except for (10) which was measured on a scale of £-20 to £20, with positive figures indicating greater generosity to the relevant BJJ school and negative figures greater generosity to self.

groups, both those with belt-whipping experiences and those without rated their belt promotion experiences as more positive than negative: belt-whipping group,  $M_{\text{Positive}} = 4.88$  ( $SD = 1.10$ ) versus  $M_{\text{Negative}} = 2.65$  ( $SD = 1.16$ ),  $t(280) = 23.04$ ,  $p < .001$ ,  $d = 1.91$ ; non-belt-whipping group,  $M_{\text{Positive}} = 4.72$  ( $SD = 1.18$ ) versus  $M_{\text{Negative}} = 1.89$  ( $SD = 1.08$ ),  $t(259) = 30.75$ ,  $p < .001$ ,  $d = 1.91$ .

These results confirmed that ritual belt promotions featuring belt-whipping gauntlets resulted in higher levels of negative affective arousal than other promotions, but both types of promotions were experienced as overall more positive than negative events. Having confirmed that the two groups differed in the ways anticipated, we next conducted a two-tailed *t*-test to examine whether levels of identity fusion and group identification also differed between the groups.<sup>2</sup> Contrary to our hypothesis, no significant differences were found between the groups for identity fusion,  $t(561) = -.27$ ,  $p = .79$  or for group identification,  $t(567) = .12$ ,  $p = .90$ .

Having found no difference between those with belt-whipping experiences and those without such experience, we next explored correlations between scores of positive and negative affect and identity fusion across the full sample. We took the positive and negative measures to serve as indicators for how emotionally arousing promotion experiences had been and thus anticipated a positive correlation with identity fusion scores. In accordance with the existing literature we additionally anticipated a stronger relationship would be observed between the negative measure and identity fusion than with the positive measure.

Again contrary to expectations, positive affect scores were found to be correlated with identity fusion,  $n = 525$ ,  $r_s = .36$ ,  $p < .001$ , and group identification,  $n = 531$ ,  $r_s = .25$ ,  $p < .001$ , whereas negative experience scores did not correlate with either identity fusion,  $n = 518$ ,  $r_s = .08$ ,  $p = .08$ , or group identification,  $n = 525$ ,  $r_s = .08$ ,  $p = .08$ .

### **Hypothesis 2: Levels of Affective Arousal during Promotion Rituals Will Display a Stronger Relationship with Identity Fusion, than with Group Identification**

First we examined the correlation between fusion and group identification across the full sample and found that the variables were moderately correlated,  $n = 560$ ,  $r_s = .57$ ,  $p < .001$ . This moderate level of correlation was anticipated, as previous studies have reported similar levels while still finding divergent validity between the constructs (Bortolini et al., 2018; Gómez et al., 2011; Swann et al., 2009).

<sup>2</sup>Mann-Whitney tests were conducted as a follow-up validity check due to moderately non-parametric distributions (Lumley, Diehr, Emerson, & Chen, 2002).

To take account of the shared variance we first computed the residuals for identity fusion (regressed on group identification) and group identification (regressed on identity fusion); these residuals were then regressed on the positive and negative affect scores. The results indicated that while positive experience scores were positively associated with both group identification,  $n = 515$ ,  $\beta = .09$ ,  $p = .05$ , and identity fusion,  $n = 515$ ,  $\beta = .25$ ,  $p < .001$ , the relationship was significantly stronger for identity fusion,  $z = 2.69$ ,  $p < .001$ . Alternatively, for the negative affect measure the data indicated null results for relationships with both group identification,  $n = 515$ ,  $\beta = .05$ ,  $p = .30$ , and identity fusion,  $n = 515$ ,  $\beta = .04$ ,  $p = .32$ .

### **Hypothesis 3: More Painful Promotional Rituals Will be Positively Associated with (A) Perceived Social Bonds, and (B) Costly Pro-Group Sacrifices**

To examine the relationship between collective pain and group bonding we used the single item pain measure and looked at correlations, across the sample, with scores on group identification, identity fusion, and relational bonds. No correlations were found between pain and either group identification,  $n = 533$ ,  $r_s = .06$ ,  $p = .18$ , and identity fusion,  $n = 528$ ,  $r_s = .05$ ,  $p = .28$ . But a weak positive relationship was found between pain and the relational bond measure,  $n = 528$ ,  $r_s = .10$ ,  $p = .03$ .

Next, we examined whether pain scores displayed a relationship with the three pro-group sacrifice measures. For all three measures no statistically significant relationship was observed: (Sacrifice 1) Donate time,  $n = 533$ ,  $r_s = -.02$ ,  $p = .65$ , (Sacrifice 2) Risk life,  $n = 531$ ,  $r_s = .06$ ,  $p = .17$ , (Sacrifice 3) Donate money,  $n = 360$ ,  $r_s = .01$ ,  $p = .87$ .

Overall, the only significant correlation observed was between pain and relational bonds and this was weak and on the edge of conventional significance boundaries.

### **Hypothesis 4: There Will be a Positive Relationship Between the Level of Negative Affect Experienced During a Ritual Promotion and the Perception of a BJJ School's Status**

For consistency across analyses, we first tested for an association between negative promotional rituals and perceptions of group status by using one-way *t*-tests to compare scores on group status measures between those in the sample who had experienced belt-whipping during their belt promotions and those who had not. We found no difference between these groups on either measure: (Group status 1) Admired,  $t(565) = -.03$ ,  $p = .97$ ; (Group status 2) Respected,  $t(566) = -1.10$ ,  $p = .27$ . Having found no difference we next employed the full sample to test for correlations between the two group status measures and the negative affect measure. We found no evidence of a

relationship with either group status measure: Group status 1—Admired,  $n = 523$ ,  $r_s = .03$ ,  $p = .48$ ; Group status 2—Respected,  $n = 523$ ,  $r_s = .01$ ,  $p = .82$ .

For exploratory purposes we also tested for a relationship between the group status measures and positive affect. Here, we observed significant correlations with both group status measures: Group status 1—Admired,  $n = 530$ ,  $r_s = .30$ ,  $p < .001$ ; Group status 2—Respected,  $r_s = .19$ ,  $p < .001$ . To examine whether these relationships remained when controlling for confounding factors, independent linear regressions were conducted with each of the two group status measures. Potentially confounding factors were identified from the demographic, training, and personality variables through exploratory correlation analysis and a preliminary regression model. Confounding variables were then entered into regression models along with both positive and negative affect measures (Table 3).

For both group status outcomes significant overall models were produced: Group status 1—Admired,  $F(6,482) = 13.21$ ,  $p < .001$ ,  $\text{Adj. } R^2 = .13$ ; Group status 2—Respect,  $F(4,481) = 8.41$ ,  $p < .001$ ,  $\text{Adj. } R^2 = .07$ . However, inspection of standardised residuals for the model with the group status-respect measure as the outcome indicated that normality assumptions were not met and thus coefficients should be interpreted cautiously. Despite this limitation, both models displayed consistent results with positive affect continuing to display a highly significant relationship with both group status measures when controlling for confounding variables. Negative affect conversely displayed no significant relationship in both models.

### Hypothesis 5: Identity Fusion Will Predict Willingness to Endorse or Perform Costly Pro-Group Sacrifices Better than Group Identification

To test this hypothesis we first examined correlations between fusion, group identification, and our three costly sacrifice measures. Moderate correlations were observed between identity fusion scores and both self-report pro-group sacrifice measures, SAC1—Donate time,  $n = 561$ ,  $r_s = .52$ ,  $p < .001$ ; SAC2—Risk life,  $n = 559$ ,  $r_s = .55$ ,  $p < .001$ , and a weaker but still highly significant correlation was observed with the behavioural measure: SAC3—Donate money,  $n = 377$ ,  $r_s = .25$ ,  $p < .001$ . Similar patterns were also found between the pro-group sacrifice outcomes and the group identification measure: SAC1—Donate time,  $n = 567$ ,  $r_s = .38$ ,  $p < .001$ ; SAC2—Risk life,  $n = 559$ ,  $r_s = .37$ ,  $p < .001$ ; SAC3—Donate money,  $n = 380$ ,  $r_s = .17$ ,  $p = .001$ .

Having established the presence of linear relationships, we next sought to address whether identity fusion was a better predictor than group identification of the sacrifice outcomes. To do so, hierarchical linear regression analyses were conducted with each of the pro-group sacrifice measures. The same three-stage process was followed for all of the regression analyses:

**Table 3.** Hierarchical regression on group status measures

Variable	Outcome: Status measure			
	Admired		Respected	
	<i>b</i> (SE)	$\beta$	<i>b</i> (SE)	$\beta$
Constant	1.21 (0.41)	—	3.91 (0.25)	—
Age	0.02 (0.01)	.14***	0.01 (0.01)	.09*
Train per week	0.02 (0.01)	.10*	0.02 (0.01)	.10*
Hor-Coll.	0.16 (0.06)	.11*	—	—
Ver-Idv.	0.21 (0.05)	.19***	—	—
Positive Exp.	0.18 (0.04)	.22***	0.16 (0.03)	.21***
Negative exp.	0.01 (0.04)	.01	0.01 (0.03)	.01
Adj. $R^2$	.13		.07	
<i>F</i>	13.21		8.41	
<i>df</i>	6, 482		4, 481	

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

in the first step, potentially confounding variables from the demographic, training, and personality measures were entered; in the second, group identification was added; finally, identity fusion was added and coefficients and  $R^2$  change between models were assessed. Final regression models for the two self-report measures are presented in Table 4, but full details of the preliminary models are provided in the supplementary material.

**Sacrifice 1—Donate time.** A preliminary regression model identified two variables as potential confounds: average hours training per week, and horizontal allocentric personality traits. These variables were entered as the first stage of a hierarchical regression, with group identification added in the second, and identity fusion in the third. Each model showed significant improvements in the total variance accounted for and in the final model, identity fusion was the strongest contributing predictor in the model.

**Sacrifice 2—Risk life.** A preliminary regression analysis identified three variables as potential confounds: average hours training per week, horizontal

**Table 4.** Final hierarchical regression models for self-reported pro-group sacrifice measures

Variable	Outcomes			
	Sac 1—Donate time		Sac 2—Risk life	
	<i>b</i> (SE)	$\beta$	<i>b</i> (SE)	$\beta$
Constant	2.37 (0.24)	—	-0.65 (0.51)	—
Age	—	—	-0.01 (0.01)	-.06
Hours per week	0.02 (0.01)	.12**	0.04 (0.01)	.12***
Hor-Coll.	0.19 (0.05)	.15***	0.03 (0.10)	.01
Ver-Coll.	—	—	0.08 (0.06)	.05
Group ident.	0.14 (0.04)	.14***	-0.02 (0.08)	-.01
Identity fusion	0.29 (0.04)	.34***	0.77 (0.07)	.51***
Adj. $R^2$	.29		.32	
<i>F</i>	54.86		42.42	
<i>df</i>	4, 535		6, 522	

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

allocentric personality traits, and vertical idiocentric traits. The same three-stage step regression model was then performed and the same pattern as with the donate time measure was observed: each model displayed significant improvements in the total variance accounted for and the final model indicated that identity fusion was the strongest contributing predictor in the model.

**Sacrifice 3—Donate money.** Finally, we examined the behavioural measure of voluntary monetary allocations made to the relevant BJJ school. Responses to the donation measure,  $n = 380$ , displayed a clear bimodal distribution, caused by 61% of respondents keeping the full payment for themselves and 27.2% donating the full £20. This made the data unsuitable for linear regression analyses. Instead a cumulative odds ordinal logistic regression analysis was conducted after responses to the donation measure were converted into an ordinal scale with three levels: 1 = £4 or less, 2 = £5–£14, 3 = £15–20. This three-level categorisation was used instead of a binary outcome to avoid discarding the 11.9% of responses that fell between the two distribution peaks.

As regression coefficients were likely to be unreliable due to the bipolar distribution, potential confounding factors were identified using simple non-parametric correlation analysis, with bootstrapping applied (5,000 samples), rather than an exploratory regression. From this analysis, the two allocentric personality scales were identified as potential confounds: horizontal allocentricism,  $n = 380$ ,  $r_s = .19$ ,  $p < .001$  and vertical allocentricism,  $n = 378$ ,  $r_s = .14$ ,  $p < .01$ . To maintain consistency with the preceding analyses three ordinal logistic regressions were then performed.

The results from this analysis resembled those obtained with the two previous linear regressions: the contribution of group identification was significant when added in the second stage, but in the final stage when identity fusion was entered it became the strongest predictor in the model, while group identification was no longer a significant predictor (Table 5). In summary, amongst participants who took part in the reward lottery higher identity fusion scores were associated with greater voluntary donations to their BJJ school, when controlling for personality factors, and categorical group identification. Each increase on the identity fusion measure was associated with a 1.62 times greater likelihood to allocate some amount of money to the BJJ school and a 1.58 times greater likelihood to donate the full amount.

Collectively, all three pro-group sacrifice measures displayed stronger positive relationships with identity fusion as compared with group identification.

### Exploratory Analysis

Having established that experiences that were judged as more positive were associated with increased identity fusion and finding the hypothesised association

between fusion and costly pro-group sacrifices, we sought to examine whether the findings could be combined into a single coherent model. The model we proposed specified that identity fusion, rather than group identification, would serve as the core mediating pathway between positive experiences of promotion rituals and willingness to endorse or perform costly pro-group sacrifices.

Bias corrected bootstrap mediation analyses based on 5,000 bootstrap samples with two parallel mediating variables ( $M_1 =$  identity fusion and  $M_2 =$  group identification) were conducted using PROCESS V3.0 (Model 4; Hayes, 2012) to examine the relationship between positive affective experiences and the three pro-group sacrifice outcomes. Analogous mediation analyses were also conducted for the negative affect measure, but as anticipated from the results collected when testing hypotheses 1 and 2, no significant indirect pathways were found. Figure 4 visually represents the mediation pathways for each of the three pro-group sacrifice outcomes.

On the first sacrifice measure, concerning willingness to donate time mediating effects from positive experience scores were found to operate through both identity fusion,  $b = 0.13$  (0.02), 95% CI [0.08, 0.18], and group identification,  $b = 0.05$  ( $SE = 0.02$ ), 95% CI [0.02, 0.09]. Comparisons of these indirect effects found that the fusion pathway was stronger than the identification pathway,  $b = 0.08$  ( $SE = 0.03$ ), 95% CI [0.01, 0.14].

Applying the same model to the second sacrifice measure, willingness to risk life to protect the BJJ school, a significant indirect pathway was found to operate through identity fusion,  $b = 0.26$ ,  $SE = 0.04$ , 95% CI [0.19, 0.35], and there was no indirect pathway detected through group identification,  $b = 0.00$ ,  $SE = 0.02$ , 95% CI [−0.03, 0.04].

The final sacrifice measure, the voluntary monetary donation, had a response distribution that made linear regression analyses unreliable. Nevertheless, for exploratory purposes we fitted the same mediation model to the ordinal transformation of this measure used in analysis of Hypothesis 5. The results obtained indicated a fully mediated indirect pathway from positive experience to donation amount, operating through identity fusion,  $b = 0.05$ ,  $SE = 0.02$ , 95% CI [0.02, 0.09], with no significant pathway found through group identification,  $b = 0.01$ ,  $SE = 0.01$ , 95% CI [−0.02, 0.03].

Given the correlational nature of our data, to provide a more robust test of the proposed mediation pathway we also examined the three pro-group outcomes with alternative mediation models with identity fusion as the direct predictor and positive affect operating as a mediator, in parallel with group identification. This enabled us to test whether the causal relationship was running in reverse with more highly fused group members providing more positive assessments of their experiences and then in turn showing more willingness to perform pro-group sacrifices. However, all of the alternative mediation models resulted in

**Table 5.** Hierarchical logistic regression on monetary donation to BJJ school

Variable	Outcome: Monetary donation to BJJ school					
	STAGE 1		STAGE 2		STAGE 3	
	<i>b</i> ( <i>SE</i> )	OR	<i>b</i> ( <i>SE</i> )	OR	<i>b</i> ( <i>SE</i> )	OR
Donate some	2.46 (1.24)	—	−0.78 (0.57)	—	−3.31 (1.37)	—
Hor-Coll.	0.04 (0.25)	1.03	0.26 (0.10)	0.94	−0.18 (0.27)	0.84
Ver-Coll.	0.16 (0.18)	1.17	0.16 (0.07)	1.10	0.05 (0.18)	1.05
Group ident.	—	—	0.40 (0.07)	1.42	0.08 (0.23)	1.08
Identity fusion	—	—	—	—	0.48 (0.21)	1.62*
Donate all	−4.77 (1.01)	—	−5.43 (1.10)	—	−5.38 (1.11)	—
Hor-Coll.	0.64 (0.20)	1.89***	0.58 (0.20)	1.78**	47 (0.21)	1.60*
Ver-Coll.	0.24 (0.14)	1.27	0.19 (0.14)	1.21	0.12 (0.14)	1.12
Group ident.	—	—	0.26 (0.14)	1.30	0.02 (0.16)	1.02
Identity fusion	—	—	—	—	0.46 (0.15)	1.58**
Nagelkerke pseudo $R^2$	.06		.07		.11	
$\chi^2$	17.78		23.23		35.01	
<i>df</i>	4		6		8	

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

substantially weaker or entirely insignificant indirect pathways, (Sacrifice 1) Donate Time  $b = 0.04$ ,  $SE = 0.02$ , 95% CI [0.07, 0.20]; (Sacrifice 2) Risk Life- $b = 0.05$ ,  $SE = 0.01$ , 95% CI [0.02, 0.08]; (Sacrifice 3) Donate Money  $b = 0.01$ ,  $SE = 0.04$ , 95% CI [−0.01, 0.06].

Taken together the mediation analyses offered preliminary confirmatory evidence for a combined model wherein promotion rituals that involved more positive affect were associated with higher levels of identity fusion, and this in turn predicted greater willingness to endorse or perform costly sacrifices. Significantly, the same pathway was not found to consistently operate through group identification.

## Discussion

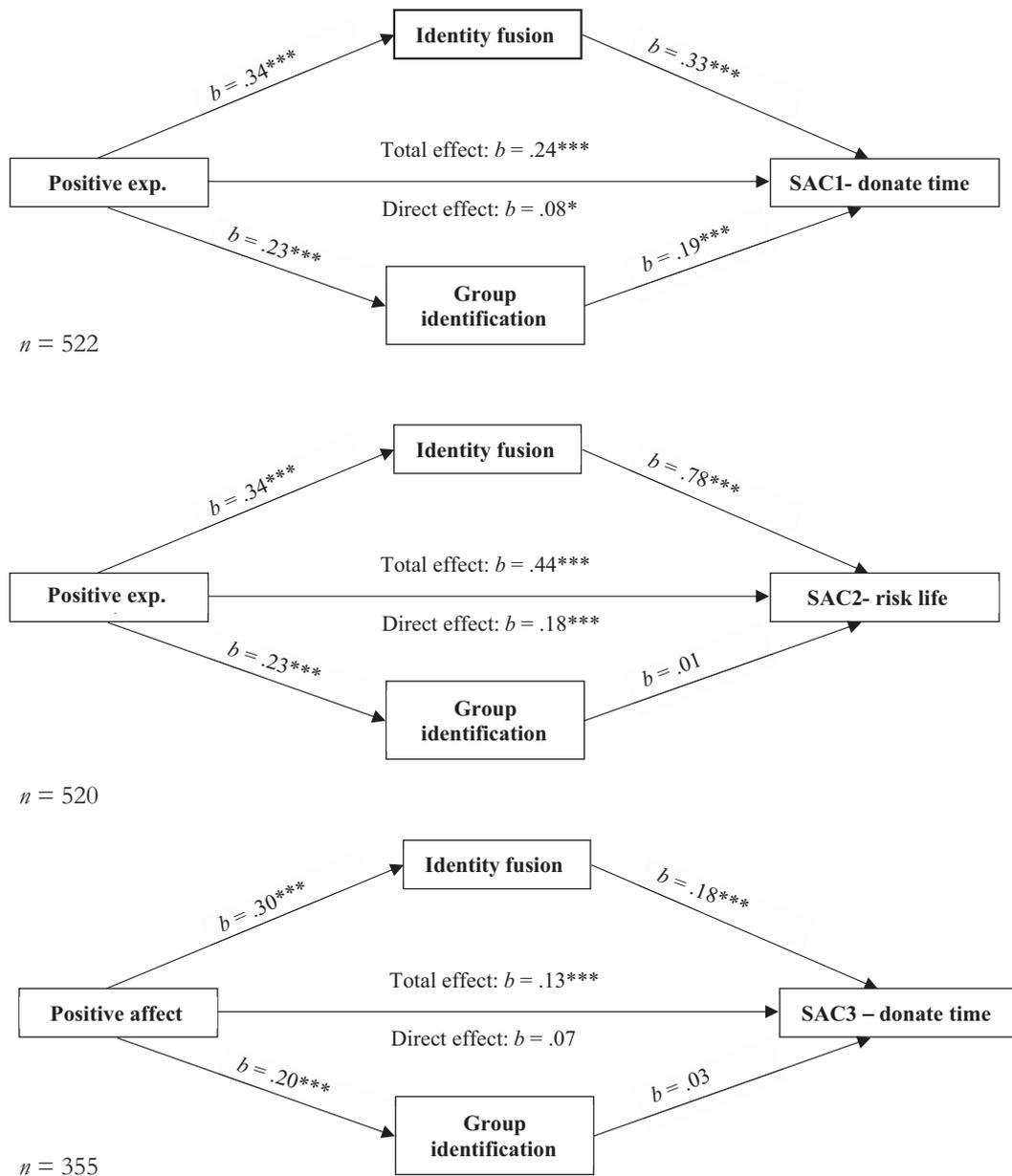
The current study offers important new evidence from a novel ritual context concerning recently proposed links between high arousal 'imagistic' ritual experiences and identity fusion bonds (Whitehouse & Lanman, 2014). Currently only two other published studies have measured fusion levels in communities that perform collective rituals (Páez *et al.*, 2015; Zumeta *et al.*, 2016), and although both found increases in identity fusion after participation, neither study included comparable measures of group identifications. This means that the present study is the first to be able to directly address theoretical predictions (Whitehouse & Lanman, 2014; Whitehouse *et al.*, 2017) that there is a stronger association between high arousal ritual experiences and identity fusion over comparable group identification measures.

Our results indicated that measures of positive affect, but not negative affect, in relation to belt promotion rituals were associated with both group identification and identity fusion with relevant Brazilian Jiu Jitsu martial arts schools. Subsequent contrast analyses clarified that the relationship observed with

positive affect and identity fusion was stronger than that observed with group identification (H2a). We also found confirmatory evidence for the divergent predictive power of identity fusion and group identification measures, replicating previous findings that fusion is the stronger predictor for costly pro-group measures (H5). Additionally, when combining our results into an exploratory mediation model we found that measures of fusion, but not group identification, consistently mediated the relationship between positive experience and all three pro-group sacrifice outcomes. The group identification measure demonstrated a mediating pathway with only one pro-group outcome (donate time) but this was comparatively weaker than the pathway observed through fusion. Collectively, these results offer preliminary evidence in support of a link between high arousal rituals and identity fusion bonds proposed by Whitehouse and Lanman (2014).

However, our results do not provide unqualified support for such an association. Crucially, we observed no comparable relationship between negative affect scores and identity fusion (H2b), nor was the negative affect measure predictive of any pro-group sacrifice outcomes. Furthermore, when comparing identity fusion levels between those who had undergone painful belt-whipping gauntlets as part of their promotion rituals and those who had not, we found no difference between the groups. These findings stand in contrast to the emphasis placed on the role of negative experiences in promoting identity fusion bonds (Swann & Buhrmester, 2015; Whitehouse & Lanman, 2014), which has received support from some recent empirical studies (Jong *et al.*, 2015; Whitehouse *et al.*, 2017).

The current findings, however, are consistent with other recent studies which have reported relationships between positive collective rituals and identity fusion. Páez *et al.* (2015) and Zumeta *et al.* (2016), for instance, both found that positively valenced collective



**Fig. 4:** Mediation models for positive experience through identity fusion and group identification with three sacrifice outcomes.  $*p < .05$ ,  $***p < .001$

gatherings—involving folkloric marches and drumming—strengthened identity fusion with relevant groups. Similarly, Newson et al.'s (2016) study of devoted football fans revealed that experiences of both positive and negative 'key group events' (p. 1) were associated with higher levels of identity fusion. The association between positive affect and group bonds—as measured by identity fusion and group identification—also accords with broader research concerning the role of positive emotions in enhancing prosociality and facilitating social bonding (Isen, 2000; Kelly, Iannone, & McCarty, 2014; Parkinson, Fischer, & Manstead, 2005; Shiota, Campos, Keltner, & Hertenstein, 2004; Spoor & Kelly, 2004).

The 'shared dysphoria pathway to fusion' model outlined in Whitehouse and Lanman (2014, pp. 679–680) and Whitehouse et al. (2017) stresses a mediated

relationship between negative, potentially traumatic, experiences and identity fusion. It proposes that intense rituals promote identity fusion through individuals reflecting on their experiences and generating self-defining autobiographical memories that deepen their connections with other group members (Luminet & Curci, 2008). We did not find direct support for such a relationship based on analysis of our negative affect measures. However, since we did not collect measures of reflection we cannot speak directly to whether such a mediating mechanism exists; for either positive or negative affect.

An important point to note is that the measures we collected of positive and negative affect during promotion rituals—as with most measures in the study—were subjective and retrospective and as such were susceptible to the effects of memory degradation and

post-event reinterpretation. Furthermore, there was only a weak inverse correlation observed between negative and positive ratings of promotion experiences and no difference between positive affect scores for belt-whipping/non-belt-whipping groups. Other studies have similarly demonstrated that firewalking performers report higher levels of happiness post performance (Fischer *et al.*, 2014) and misjudge how physiologically aroused they were during performances (Xygalatas, Schjødt, *et al.*, 2013). Consequently, the self-reported positive affect scores in this study should not be interpreted as an indicator that promotional rituals lacked painful or challenging elements. We propose instead that our results demonstrate the importance of subjective perception and imply that it is *subjective* perceptions of positive affect in response to promotion rituals (of all varieties) that are predictive of fusion levels with relevant groups.

This study also tested hypotheses concerning the social bonding effect for collectively experienced pain (H3); examining if pain experienced during promotions was associated with relational bonds with other group members and pro-group sacrifice measures. However, in contrast with recent studies we failed to detect positive associations between pain and either relational bonds or pro-group sacrifice. The discrepancy could be related to the relative severity of the experiences examined; however, in Olivola and Shafir (2013) simply asking people to imagine marathons was enough to produce an effect.

A stronger counterargument is that the retrospective nature of our questionnaire meant that the promotion events under discussion had taken place, on average, over six months previously. This is important because if the social bonding effects of pain are transitory then they would be likely to have already dissipated. It would thus be premature to argue in favour of rejecting the proposed association between pain and social bonding on our null findings. On the other hand, given the sparsity of evidence available from ecologically valid studies (but see Xygalatas, Mitkidis, *et al.*, 2013) it is equally inappropriate to over-generalise from the small number of positive experimental studies. To validate the existence of a relationship between pain, social bonding, and pro-group behaviour will require further evidence from independent studies.

Finally, this study also addressed a prediction drawn from 'Automatic Accrual theory' (Cimino, 2011, 2013) and the costly signalling literature (Bulbulia & Sosis, 2011) that schools with more unpleasant promotion rituals would be evaluated by members as being of higher status (H4). The logic for this prediction was that higher status groups would need to employ rituals that required costly demonstrations of commitment (CREDS) (Henrich, 2009) in order for veteran members to prevent non-committed newcomers from freeriding on the group and gaining access to valuable resources, including association with high group status.

Controlling for a variety of confounding factors, we found a positive association between positive affective

scores of promotion ritual experiences and both group status measures and no such relationship with the negative affect score. The strength of the correlations observed was small, but this was not unexpected in such a heterogeneous sample and given the wide assortment of unrelated factors that could influence a school's status. This result was counter to the hypothesis as it suggests that higher status schools perform more positive, but not more negative, promotion rituals. A possible explanation for this result is that people who had more positive belt promotion experiences could be more likely to rate their BJJ schools more positively in general, and thus indicate they are of higher status. Alternatively, the association could reflect a genuine relationship with higher status BJJ schools producing promotional events that are more enjoyable and memorable, potentially due to greater resources, such as more personnel and better facilities. But as discussed above, the affect measures may be confounded by post-event reinterpretation—with individuals recalling challenging experiences as positive. It is difficult to distinguish between these interpretations based on the current data but nevertheless the results fail to provide support for a key prediction of Automatic Accrual theory.

### Limitations

The current study was a retrospective and cross-sectional study and therefore the causal chains posited will require additional evidence to validate, ideally through longitudinal and experimental research. The current study also focused on individuals who had personally undergone belt promotional rituals and as such we could not compare whether similar associations would be found with observers or whether there was a 'performer-observer' gap (Fischer *et al.*, 2014; Mitkidis *et al.*, 2017). Martial artists also represent a special population and there may be concerns about whether broader generalisations can be drawn from the current sample. However, there is nothing in the current literature to suggest that the hypothesised relationships we examine would not function in this context.

### Conclusion

In this study, we provide evidence that in a worldwide sample of practitioners of the Brazilian Jiu Jitsu martial art, subjective positive, but not negative, affective experiences of collective promotion rituals were associated with identity fusion group bonds. Furthermore, when compared directly against comparable group identification measures in parallel mediation models, fusion was found to be a consistently stronger mediator between positive affect and costly pro-group sacrifices. This result, replicated in three distinct sacrifice outcomes, suggests that identity fusion could serve as an important mechanism in translating high

arousal ritual experiences into pro-group outcomes. However, we did not find evidence in support of related hypotheses that negative affective experiences would display a stronger association than positive affective experiences with identity fusion group bonds or that collectively experienced pain would be associated with social bonding and pro-group action. Similarly, we failed to find evidence in support of Automatic Accrual theory's prediction that high status groups would be associated with more challenging group rituals.

The current results should also be interpreted with due consideration of the current limitations in regard to the amount of comparable empirical studies, many of which do not directly examine ritual contexts. Our findings suggest that future studies examining collective rituals and group bonding should consider the role played by positive affect, including subjective positive experiences of objectively painful rituals. Care should also be taken when specifying hypotheses to clearly specify whether hypothesised associations refer to subjective experiences or objective features of ritual events. Finally, from our results we tentatively suggest the following prediction, which we also intend to test in a pre-registered follow-up study: changes in fusion with groups following collective ritual events will be associated with changes in positive affect, rather than changes in negative affect.

### Acknowledgements

This research was supported by a Horizon 2020 Excellent Science Grant provided by the ERC (Ritual Modes, No. 694986) and an award by the John Templeton Foundation under the Religion's Impact on Human Life Project.

### Conflict of Interest

The authors declare that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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## Appendix

Thanks for taking part! First, some general questions about your training history. If you cannot answer any of the questions just make a rough estimate or indicate that the question is not applicable to you by ticking or typing 'N/A'. If you train with more than one BJJ school or travel between different schools then for questions asking about your specific BJJ school please answer with regard to the group you currently feel the strongest association with. Similarly, if you are currently not training then please answer in regard to the group you previously felt the strongest association with.

\*Also please note throughout the questionnaire that the term 'BJJ school' is intended to act as a collective term to refer to all BJJ academies/gyms/schools/teams, etc.\*

1. Approximately how long in total have you been training in BJJ? (Please answer using years & months)
2. Have you had any sustained breaks in your training?
3. Approximately how long did the training breaks last collectively? (Please answer using years and months)
4. Are you currently training?
5. Approximately how long have you been training with your current BJJ school? (Please answer using years & months)
6. What is your current belt in BJJ?
7. Does your school use stripes as well as coloured belts to differentiate training achievements?
8. How many stripes do you have?
9. Which of the following most accurately describes your role in your BJJ school: (Select one or more boxes)
  - Head Instructor (1)
  - Assistant Instructor (2)
  - Owner/Organiser (3)
  - Professional Competitor (4)
  - Amateur Competitor (5)
  - Non-Competing Student (6)
  - Complete Beginner (7)
10. On an average week, approximately how many hours do you train in BJJ? (Please answer in hours)
11. Do you currently, or have you in the past, competed in BJJ tournaments?
12. On average, how many competitions per year do you currently take part in, as a competitor?
13. On average, how many competitions per year do you currently attend, as an observer?
14. What are your motivations for training in BJJ? (Use your cursor to drag the answers supplied into rank order with 1 signifying the most important motivation and 6 the least important)

- \_\_\_\_\_ To compete in tournaments (1)
- \_\_\_\_\_ To learn self-defence (2)
- \_\_\_\_\_ To train for fitness (3)
- \_\_\_\_\_ To become an instructor (4)
- \_\_\_\_\_ To compete in Mixed Martial arts (5)
- \_\_\_\_\_ To socialise (6)
- \_\_\_\_\_ For fun/enjoyment (7)

15. Are there any other important factors not included above which motivate your training in BJJ?

Please briefly describe any other significant factors which motivate you to train.

- 16. Do you train with any other martial arts groups?
- 17. How many other groups do you train with?
- 18. What, if any, affiliation does your BJJ school have?

Section 2 of 4: Half way there. This section is focused on your experience with your experiences at belt promotions/gradings. If you cannot answer any of the questions exactly, either select the most applicable answer or tick/type 'N/A'.

Have you attended any belt promotions/gradings during your time training in BJJ?

The questions below concern specific details of your BJJ school's belt promotion/grading ceremonies. The questions mainly ask about the formal belt promotion/grading practices at your current, or most recent, BJJ school, however please read the questions carefully as some refer to your wider experiences and informal situations.

1. Approximately how many formal belt promotions/gradings have you attended throughout your entire training history (including as an observer)?
2. Approximately how many informal belt promotions/gradings (i.e., those which occur spontaneously as part of/at the end of a normal class) have you witnessed throughout your entire training history (including as an observer)?
3. On average, how often does your school hold formal belt promotions/gradings?
4. Have all the BJJ belt promotions/gradings you attended been with the school you are currently training with?
5. Approximately how many belt promotions/gradings have you attended at your current school?
6. Do the belt promotions/gradings at your current, or most recent, BJJ school involve a belt-whipping gauntlet?
7. At this school approximately, how many times have you received a belt-whipping as part of your belt promotion/grading?
8. At this school approximately, how many times have you inflicted a belt-whipping as part of other members' belt promotions/gradings?

9. Do belt-whipping gauntlets at your current BJJ school require that the person receiving the whipping remove their gi jacket?
10. Approximately how long does it take one individual to complete a belt-whipping gauntlet at your school?
11. On average, who is involved in inflicting whips during a single belt-whipping gauntlet at your BJJ school?(Tick as many boxes as appropriate)

- The instructor(s) (1)
- Higher Grades (Brown & Purple Belts) (2)
- Lower Grades (Blue Belts & Experienced White Belts) (3)
- Beginners (4)
- All of the above/Everyone present (5)
- Other (9) \_\_\_\_\_

12. How many people on average take part in a belt-whipping gauntlet at your BJJ school?
13. Do belt promotions/gradings at your current, or most recent, BJJ school involve being thrown?
14. On average, who performs the throws? (Tick as many boxes as appropriate)

- The instructor(s) (1)
- Higher Grades (Brown & Purple Belts) (2)
- Lower Grades (Blue Belts & Experienced White Belts) (3)
- Beginners (4)
- All of the above/Everyone present (5)
- Other (9) \_\_\_\_\_

15. Approximately, how many times have you been at a grading ceremony and received throws as part of your belt promotion/grading?
16. Approximately, how many times have you performed throws on someone else as part of their belt promotion/grading ceremony?
17. Do belt promotions/gradings at your current, or most recent, BJJ school involve continuous sparring against multiple opponents (as part of the grading rather than as a normal lesson)?
18. At belt promotions/gradings during which you have been promoted how many have involved sparring continuously against multiple opponents?
19. Approximately how many times have you served as one of a series of sparring opponents during someone else's belt promotions/gradings?
20. On average, who takes part in sparring against those being promoted/graded? (Tick as many boxes as appropriate)

- The instructor(s) (1)
- Higher Grades (Brown & Purple Belts) (2)
- Lower Grades (Blue Belts & Experienced White Belts) (3)

Beginners (4)  
 All of the above/Everyone present (5)  
 Other (9) \_\_\_\_\_

21. On average how long in total would you estimate that a belt promotion/grading takes for one person at your BJJ school? (Please answer in mins)
22. Are formal tests of technique a part of your BJJ school's belt promotions/gradings?
23. How long has it been since you last attended a belt promotion/grading ceremony? (Please answer in years/months)
24. How long has it been since you last attended a belt promotion/grading ceremony during which you were promoted? (Please answer in years/months)
25. Approximately how long ago was the first belt promotion/grading ceremony you attended? (Please answer in years/months)
26. Approximately how long ago was the first belt promotion/grading ceremony you attended during which you were promoted? (Please answer in years/months)
27. Before joining your BJJ school how aware were you of your school's belt promotion/grading practices?

I had no idea (1)  
 I had a vague idea (2)  
 I didn't know about my school specifically but I knew about BJJ gradings in general (3)  
 I knew quite a bit about gradings at the school (4)  
 I had attended/observed gradings at the school before joining (5)

28. Does your BJJ school charge for belt promotions/gradings?
29. How much on average does a belt promotion/grading cost at your BJJ school?
30. Are there any other important elements of a grading at your BJJ school that you think are not mentioned in the above options? (If so, please specify)

Section 3 of 4: This section addresses your personal response to your belt promotion/grading experiences with your current, or most recent, BJJ school. If you have not yet been promoted at a grading then please answer based on your observations of the belt promotion/grading ceremonies you have witnessed at your BJJ school. If you cannot answer any of the questions either select the most applicable answer or tick/type 'N/A'.

1. How intense would you consider your belt promotion/grading experiences with your current, or most recent, BJJ school?

Not intense at all (1)–Extremely Intense (6)

2. How painful would you consider your belt promotion/grading experiences with your current, or most recent, BJJ school?

Not painful at all (1)–Extremely painful (6)

3. How unpleasant would you consider your belt promotion/grading experiences with your current, or most recent BJJ school?

Not unpleasant at all (1)–Extremely unpleasant (6)

4. How enjoyable would you consider your belt promotion/grading experiences with your current, or most recent, BJJ school?

Not enjoyable at all (1)–Extremely enjoyable (6)

5. How meaningful would you consider your belt promotion/grading experiences with your current, or most recent, BJJ school?

Not meaningful at all (1)–Extremely meaningful (6)

6. How valuable would you consider your belt promotion/grading experiences with your current, or most recent, BJJ school?

Not valuable at all (1)–Extremely valuable (6)

We are interested in your intuitions about the meaning of the BJJ belt promotion/grading ceremonies you have participated in or observed. In the space provided below, please write down your thoughts about the overall meaning of the grading ceremonies and/or the specific elements mentioned in the previous section.

Below is a list of statements about your BJJ school. Please read the statements and indicate on the scale to what extent you would agree with the statements:

\*Also please note that 'BJJ school' is intended to act as a collective term to refer to all BJJ clubs/academies/gyms/teams, etc.

Please indicate your agreement with the statements to the left.

Strongly Disagree (1)–Strongly Agree (6)

1. When someone criticises my BJJ school, it feels like a personal insult.
2. I am very interested in what members of other teams think about my BJJ school.
3. When I talk about my BJJ school, I usually say 'we' rather than 'they'.
4. Successes of my BJJ school are my successes.
5. When someone praises my BJJ school, it feels like a personal compliment.
6. If the media criticised my BJJ school, I would feel embarrassed.

Please indicate your agreement with the statements to the left.

Strongly Disagree (1)–Strongly Agree (6)

1. I know the personality differences among members of my BJJ school.

2. I think all the members of my BJJ school are somehow personally connected to each other.
3. I think all the members of my BJJ school are somehow personally connected to me.
4. If my BJJ school really needed me I would be willing to donate my free time to it.
5. If my BJJ school were threatened, I would be willing to risk my life fighting to defend it.
6. Most people in my BJJ school behave in a similar way.
7. Most people in the group are similar to each other in their values and in preferences.
8. People in other BJJ groups, generally admire my BJJ school.
9. In general, my BJJ school is not respected by other BJJ groups.

Please indicate your agreement with the statements to the left.

1. I am one with my BJJ school.
2. I feel immersed in my BJJ school.
3. I have a deep emotional bond with my BJJ school.
4. My BJJ school is me.
5. I'll do for my BJJ school more than any of the other members would do.
6. I am strong because of my BJJ school.
7. I make my BJJ school strong.

Section 4 of 4: To help us contextualise the answers you provided about the BJJ belt promotion/grading ceremonies this section asks a series of more general questions which are designed to help us identify your personal values.

Now we will ask you some questions about yourself. Please indicate to what extent you agree or disagree with the following statements.

Strongly Disagree (1)–Strongly Agree (6)

1. I would rather depend on myself than others. (1)
2. I rely on myself most of the time; I rarely rely on others.
3. I often do my own thing.
4. I enjoy being unique and different from others in many ways.
5. It is important that I do my job better than others.
6. Winning is everything.
7. Competition is the law of nature.
8. When another person does better than I do, I get tense and aroused.
9. If a co-worker gets a prize, I would feel proud.

10. The wellbeing of my co-workers is important to me.
11. To me, pleasure is spending time with others.
12. I feel good when I cooperate with others.
13. Parents and children must stay together as much as possible.
14. It is my duty to take care of my family, even when I have to sacrifice what I want.
15. Family members should stick together, no matter what sacrifices are required.
16. I would do what would please my family, even if I detested that activity.

Thank you for completing the main questionnaire, your participation is greatly appreciated! Before finishing we would like to record a few pieces of demographic information. Please select the appropriate responses and note that any answers you supply here will be kept entirely anonymous.

1. What sex are you?
2. What is your age? (Please answer in years)
3. In which country do you currently live?
4. What is your nationality?
5. What is your ethnicity? (Tick as many as apply)
6. What best describes your religious affiliation? (Tick any that apply)
7. Is English your first language?

After the survey is complete responses can be entered into a random draw to win £20 (approx. \$30), if you chose to participate. This £20 can be kept for personal use, donated to your BJJ school, or the amount can be split between you and your BJJ school. If selected as a winner, you will be contacted by email to arrange a suitable method of payment for the amount you designate for personal use (e.g. PayPal) and any amount designated for your BJJ school will be sent to the school anonymously. Please note that the selected winners' identities will also be kept entirely anonymous along with their responses. Please indicate below whether you would like to be included/excluded from the draw.

Please indicate below, if selected, how much of the £20 reward you would like to keep for personal use and how much you would like to donate to your BJJ school. Please ensure the total amount equals £20.

\_\_\_\_\_ Reward in £ for Personal Use (1)

\_\_\_\_\_ Reward in £ to donate to BJJ School (2)