THE EFFECTS OF COLLECTIVE RITUAL ON AFFECT, UNITY, AND PRO-
SOCIALITY: A NATURALISTIC STUDY.

BY

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Abstract

Anthropologists have long speculated that collective group rituals endure due to their functional capacity to foster co-operation and cohesion within groups and thus help societies to overcome free-rider problems. Recently, experimental studies have provided empirical data to support this hypothesis and have suggested that synchronous group movement as a key element in this process. Further more, recent field studies have suggested that the sacred values surrounding rituals may mediate the synchrony/pro-sociality relationship. The current study aims to further explore the psychological affects of group ritual in terms of positive affect, perceptions of group unity, and pro-sociality in naturalistic settings. Additionally the current study extrapolates out physical arousal and religiosity as important elements of ritual as well as synchronous movement. Our results suggest that the psychological modulations of positive affect, perceived group unity, and pro-sociality in rituals are primarily due to the meaning context within which they are performed. Results have also shown that when used together in a religious context, rituals that use high levels of synchrony and physicality are associated with higher levels of positive affect and co-operation within groups. These findings may help to explain the expansion of charismatic religions in those regions of the world where there are lower levels of security. They also suggest that past laboratory studies of ritual have been limited due to their inability to assess the meaning contexts that may be driving the effects found. Further research is required to assess the rates of endurance of these psychological affects outside of ritualistic settings and also the generalisation of pro-sociality to out-groups. Also, future development of more accurate measures of variables for field use will provide additional strength and reliability within this field.

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Overview

How do societies find and sustain longevity in the face of scarcity of resources and the self-interests of individuals? Large modern societies appear to be the result of a continuous evolution from simpler, familial-based social groupings (Lesser, 1961). This evolution of human networks has created not only the mega-metropolises of modernity, but also has created virtual networks such as Facebook that has made 800 million individuals to become more intertwined than ever before. Although social networks and grouping exist to make life easier, the endurance of these social groups over time suggests that cultural evolution has also found ways to successfully hold at bay the propensity for individuals to ride freely on the expense of others. To avoid the resource degradation that occurs with free-riding, large-scale social co-operation is required (Axelrod, 1984) so that public resources are used at a sustainable rate and with an equitable spread of costs across all users. Co-operation and altruism are elements of pro-social behaviour which evolutionary scientists have long found challenging to explain. Classical theories of natural selection do not well explain the myriad of behavioural cases in which an individual acts in a way that promotes the advantages of others, at the expense of themselves (Hamilton, 1963). So why does pro-sociality occur so commonly, what mechanisms enable these virtuous behaviours to endure, and how are they maintained over time?

Researchers from the fields of anthropology, economics and psychology have conjectured that the traditional ritualistic practices that have been found across the globe in all cultures, are active in the formation of virtuous, pro-social behaviours as they foster co-operation and group cohesion (Durkheim, 1897;1915; Haidt, Seder, & Kesebir, 2008; Sosis, 2003). The universality of collective group rituals has been comprehensively shown since early European exploration of indigenous peoples and

yet these ritualistic behaviours have been just as difficult to explain within classical evolutionary theory as the pro-sociality they have been suggested to support. Group rituals all over the world often appear to hold no obvious instrumental value and are often very costly activities both in terms of resources and personal comfort, while being held as sacred by both indigenous and modern peoples. Recent experimental research has supported the anthropological hypothesis of an implicit value of ritual because it facilitates co-operation, and synchronous rhythmic interaction appears to function as a key element relating traditional ritualistic practice to pro-social behavioural outcomes of co-operation and group cohesion (see Wiltermuth & Heath, 2009; Lakens, 2010; Valdesolo, Ouyang & DeSteno, 2010).

The current study looks to expand on the recent and original field study in my BSc Honours thesis (see Fischer, Callander, Reddish, & Bulbulia, in press) in which, seeking to add validity to the previous experimental findings from the laboratory, they investigated the effects of nine naturally occurring rituals on pro-sociality in the field. Using a combination of self report and behavioural measures taken in groups including: churches, meditation groups, choirs, instrumentation and chanting groups, and running groups in New Zealand, Fischer et al., (in press) operationalised pro-sociality as (1) attitudes to others and (2) decisions in a public goods game. The nine rituals varied in levels of synchrony and the study reported that synchronous body movements were associated with increased levels of sacred values and that these sacred values predicted pro-social behaviours.

The current study will expand on our previous study by extrapolating out religiosity and physicality as additional elementals of rituals that may have important psychological effects on individual's experience of group unity and their pro-social orientations. This provides the current study with three main dimensions of interest:

the level to which the movement of two or more individuals falls into a constant rhythmic relationship with one another (synchrony), the presence of religious beliefs and values associated with the ritual activity (religiosity), and the level of physical exertion being demanded by the ritual (physicality). In addition, there still lies a point of contention between anthropological and psychological studies into the emotional aspects of rituals that was not clearly studied in the first study (see Fischer et al, in press). The current study looks to explore the role of affect as an outcome of rituals and the potential associations between the synchrony, religiosity and physicality, and individual's emotional experience. These additional theoretical avenues of exploration, while also increasing both the number of participants and the number of diverse, naturally occurring rituals included in the study, seek to provide important further insights into the science of rituals and their role in social evolution.

The central social problem: Tragedy of the commons

Societal success and longevity relies upon the effective control of free-riding and the equitable distribution of cost for public services (Sosis, 2000). Free-riding occurs when individuals consume more of a public resource than they shoulder the costs of production for, and is perceived as a natural consequence of Smithsonian self interest. Smithsonian economics (Adam Smith, 1776) has provided the cornerstone of modern economic theory with the thesis that behaviour based on self-interest, that is maximizing individual consumption and minimizing costs will lead to socially optimal outcomes. However, as outlined by Hardin in his 1968 Science paper, multiple individuals acting independently and rationally within their own self interest

will ultimately deplete shared resources and will lead to what he terms ‘the tragedy of the commons’.

In cases of public goods and services such as water supply, fish stocks and national parks, the costs of maintenance is often shared equitably by society through governmental taxation and control. In these cases, there is little incentive for individuals to conserve and instead many will choose to consume at a rate beyond what they bear the cost for and impose an external cost on society (Mason & Phillips, 1997). If such free-riding is not controlled for or moderated by some social mechanism, Hardin’s (1968) ‘tragedy of the commons’ ensures the degradation of public resources and a socially non-optimal outcome. Thus, if a society wishes to avoid heavy legislation and bureaucratic control, the most effective solution to the tragedy of the commons is the endurance of societal virtues. Co-operation, altruism and generosity encourage individual consumption to not exceed socially desirable levels at a cost to the individual (Mason & Phillips, 1997). How can such pro-social behaviours be stimulated within society?

Rituals as a solution?

Anthropologists have theorised that a related mechanism that fosters co-operation, group cohesion and altruism within a social group is the practicing of collective group rituals. Collective group rituals are deliberate social behaviours whose means-end purposes cannot be readily inferred from the action sequences of participant’s behaviours (Konvalink et al., 2011) and involve the physical congregation of individuals who are assumed to share ideological beliefs and social values. More generally ritual is operationalised as any structured social practice associated with an

institution that serves no straightforward material (economic, medical, or political) purpose. Although there are many rituals that are performed in solitude, it is these collective group rituals, now onwards referred to as ‘rituals’ that the current study seeks to explore.

Ritualistic behaviours have been documented across all cultures. Group rituals were regular and nearly universal practice among indigenous societies at the time of European contact (Ehrenreich, 2006) and our early ancestors used song and dance in a prolific manner similar to modern society (McNeill, 1995). Both indigenous and modern cultures regularly engage in rituals of singing, dancing, and chanting among other activities, and their consistent presence across diverse cultural groups suggests that ritualistic behaviours may potentially be ‘collective universals’ and as such are oriented not at the individual level but at the cultural group level (Brown, 2004).

Rituals have been suggested as an important social behaviour that functions to foster certain psychological and behavioural patterns within individuals and groups that increase societal longevity (Durkheim, 1897; 1915; Haidt, et al., 2008). Three main and important psychological variables that are affected by rituals have been frequently discussed in the literature – namely, affect, group unity/cohesion, and pro-sociality. Each of these variables will be defined and described below.

Positive Affect

The first factor that has been associated with rituals as a psychological outcome is increased feelings of positive affect - that is, the experience of positive feelings or emotions (Watson, Clark, & Tellegen, 1988). Durkheim ([1915] 1965) used the term ‘collective effervescence’ to describe the experience of communal joy generated

through ecstatic ritualistic behaviours such as dancing and drumming. He theorised that the emotions experienced in collective effervescence are the psychological variables that modulate, create and maintain long-term group cohesion.

More recently, Collins (2004) focuses on ritualised interactions and their importance in creating social structure through the collectivization of emotional energy. Collins (2004) suggests that “emotional energy” is generated as participants engage in various “interaction ritual chains.” A successful ritual, according to Collins (2004), is one in which individual’s emotional energy is enhanced while failed rituals will drain emotional energy. In much the same way as Durkheim ([1915] 1965) claims, Collins (2004) says that this collectivization and enhancement of a group’s emotional energy contributes to the emergence and reproduction of social solidarity.

This psychological phenomena of joy experienced in rituals has been suggested by Haidt, Seder, & Kesebir, (2008) to be a result of sense of self-loss due to coordinated movements of the group. Haidt et al., (2008) call this the ‘Hive hypotheses’ and claim that “the self can be an obstacle to happiness, so people need to lose their selves occasionally by becoming part of an emergent social organism in order to reach the highest levels of human flourishing” (Haidt et al., 2008). This hypotheses, although admittedly speculative, suggests that higher levels of joy can be experienced when individuals identify themselves not just with their own ‘small’ self-consciousness, but with something larger than themselves. Other authors have made similar speculation that the loss of self in group ritual is generally beneficial (Ehrenreich, 2006; McNeill, 1995). Haidt et al., (2008) concludes that happy groups of people are more than just collections of happy individuals, they are in fact dependent upon their hive-like rituals for their bright affect.

There is a potential conflict between experiential claims, anthropological theories, and experimental psychology in terms of the role of affect in rituals. Claims from both experiential participants, and theorists such as Durkheim and Haidt have been that there are notable changes in affect due to ritualistic participation and this can be seen through expressions of ecstatic joy. However, these modulations in affective arousal have not yet been confirmed by experimental research. Neither the studies of Wiltermuth & Heath (2009), or Reddish (2012) showed changes in affect due to ritualistic interventions and so uncertainty still exists as to the role of affect in rituals.

Group Unity

A second factor that has been repeatedly associated with rituals as a psychological outcome is feelings of intra-group unity. Durkheim ([1915] 1965) also claimed that being a part of a ‘moral community’ is essential for individuals to flourish. This moral community is a group that binds people to a shared set of values and social norms. He noted that suicide rates in European countries “varied inversely with the degree of integration of the social groups of which the individual forms a part” (Durkheim [1897] 1951), and that factors that increased self-sufficiency were associated with higher rates of suicide. The ‘hive hypothesis’ of Haidt et al., (2008) adds to the moral community hypothesis that the communities with the greatest well-being are those that utilize activities that allow self-consciousness to be reduced so that individuals merge into an identity greater than themselves. Closely related to these two hypotheses is a related argument by Victor Turner ([1969] 1995). Turner used the Latin word ‘communitas’ to describe the joy experienced by participants in ecstatic group rituals. He claimed that societies are engaged in an eternal cycle of structure, in

which the hierarchical social relationships are affirmed and utilised, and ‘communitas’, in which that structure is negated for a time to affirm the uniting, personal, and equitable relationships among people.

Recent laboratory experiments give preliminary evidence for this relationship between rituals and enhanced perceptions of unity in pairs and groups. Studies investigating synchronous behaviours among pairs (dyadic synchrony and mimicry) (e.g., Lakens, 2010) have shown that partners who match each other’s postures, motions, and vocalizations, tend to express higher levels of subjective liking and tend to sense enhanced oneness with others (see review by Reddish, 2012). These findings have also been extended to groups who are engaging in synchronous activity such as in Wiltermuth & Heath (2009) who showed that groups who moved in synchrony with each other felt a greater sense of social connectedness than did those who moved in asynchrony.

Pro-sociality

A third factor that has also been associated with rituals is a behavioural outcome. Pro-social behaviours are those actions that benefit other people, or society as a whole even at cost to the individual such as helping, sharing, donating, co-operating, and volunteering (Brief, & Motowidlo, 1986). Although there is little agreement about how ritual promotes co-operation, it is widely accepted that its collective nature is a critical feature (Sosis, 2003).

Anthropologists have acknowledged and discussed the relationship between ritual, group unity, and co-operation (e.g., d’Aquila and Newberg 1999, Hayden 1987, Ridley 1996, Sosis 2000, Steadman and Palmer 1995, Turner 1969). Durkheim

(1912/1995) again suggests that rituals in which movement is stereotyped across participants enhance conformity to the group, and by this moving together as a unit, participants tend to think and value themselves as a unit, which enriches their subsequent co-operation. However, empirical evidence of cooperative effects due to rituals has, until recently, been scarce (Haidt et al, 2008).

This scarcity has been lessened by recent studies from psychology laboratories that have extended the work on dyadic pairs by showing that partners who match each other's postures, motions, and vocalizations, tend to express higher levels of charity (Campbell, D. T., 1958; Hove & Risen, 2009; Miles, Nind & Macrae, 2009; Valdesolo & DeSteno, 2011; van Baaren et al., 2003, 2004). These results have also been extended to small groups and in doing so have provided empirical support to the theories that rituals increase cooperative behaviours (Valdesolo & DeSteno, 2011; Wiltermuth & Heath, 2009; Reddish, 2012). The field study of Fischer et al., (in press) has given support to these laboratory findings associating ritualistic activity with cooperative behaviours. In addition to past findings, we have suggested that co-operation is mediated by the additional meaning system of how sacred participants believe the ritual is (Fischer et al., in press).

The elementals of ritual

The research discussed above shows that rituals have predictable social-psychological effects (i.e. affect, group unity, and pro-sociality). However, further research is required to understand the psychological mechanisms that underpin these effects. The present study is interested in understanding how three elementals of ritual that differ

among institutional practices affect our psychological behavioural outcomes. These three elementals of ritual are:

- 1) Synchronicity of movement.
- 2) Levels of physical, energetic arousal.
- 3) Meaning, in terms of religious and secular context.

Synchrony

Synchrony is a term used to describe the state when two or more objects, or rhythms, fall into a constant rhythmic relationship with one another and thus become tightly entrained (Glass & Mackey, 1988; Clayton, Sager, & Will, 2004). This synchrony can be seen in two main forms; behavioural matching, and interactional synchrony (Bernieri & Rosenthal, 1991). Interactional synchrony is composed of rhythm, simultaneous movement, and a smooth meshing of interaction such as that found in a jazz band, while behaviour matching is the more exact entrainment of the same muscle movements at the same time (Bernieri & Rosenthal, 1991). This synchronous behaviour can be seen throughout our lives from walking through busy streets as we coordinate our movements with those around us to avoid accident (interactional synchrony), to the earliest forms of infant communication using mimicry (behaviour matching).

Synchrony is a salient feature of many rituals and can be seen in the tightly entrained movements of a yoga class, to the united singing of hymns in a church and mantras in a temple. This engagement in coordinated physical movement with other individuals, according to anthropologists, has been suggested to facilitate the heightened

emotional arousal experienced in ritualistic settings (see Durkheim, [1915] 1965; Collins, 2004; Haidt et al., 2008). Although admitting that the psychological mechanisms involved remain unclear, anthropologists have also suggested that it is the coordination of movement that gives rise to a heightened sense of social bonding compared to engaging in less coordinated activities (Durkheim 1915/1965; McNeill 1995; Ehrenreich, 2006). McNeill (1995) has suggested that a psychological process exists by which synchronous gross muscle movement stimulates group cohesion between participants and that it is this 'bonding' which has granted the potentially universal survival of synchronous group activities across and time and cultures. McNeill (1995) calls this theory the 'muscular bonding theory' and attributes individual's willingness to cooperate in social interactions to this muscular bonding.

McNeill's (1995) predicted association between synchronous movement and group unity has found partial supported from a recent study by Lakens (2010), which explored the effects of synchronous movement on perceptions of entitativity. Entitativity refers to the degree to which a collection of individuals are considered a meaningful group unit (Campbell, 1958). Lakens (2010) showed that figures on a screen waving in rhythmic synchrony were perceived, from an out-grouper, as being a group and that this perceived entitativity reduced as the waving became less synchronous.

Empirical exploration of experiences of group unity from an in-group perspective has been undertaken by Wiltermuth & Heath (2009), who, inspired by the lack of quantitative evidence to back up the theoretical literature on rituals, recently examined McNeill's (1995) muscular bonding theory using experimental methods. The Wiltermuth & Heath (2009) study used synchronous group walking, arm movement and vocalisations with asynchronous control groups to explore what effects variations

in synchrony had on group cohesion and co-operation. Their results showed increased levels of within-group cohesion across all three of their studies in the synchronous condition compared to the asynchronous and control conditions. Although counter to McNeill's (1995) 'muscular-bonding' hypothesis which claims that this bonding facilitates higher levels of co-operation within the group, co-operation was found not to differ between groups who sung in synchrony and those groups who increased their muscular entrainment by both singing and moving in synchrony. Wiltermuth & Heath (2009) measured co-operation using the 'weakest link' and 'public goods' economic games. In accordance with the literature of Durkheim (1915/1965) and McNeill (1995), Wiltermuth & Heath (2009) predicted that co-operation would be associated with increased levels of synchronous movement. This hypothesis was supported by their finding that showed co-operation to be higher in the synchronous movement conditions compared to asynchrony, and control conditions. Wiltermuth & Heath (2009) however did not find any difference in mood between the synchronous, asynchronous, and control conditions as suggested in the literature linking ritual to heightened affect (see Durkheim, [1915] 1965; Collins, 2011; Haidt et al., 2008). Wiltermuth & Heath (2009) interpreted these results as showing that synchronous movement does not require muscular bonding or aroused emotional states to create a willingness to cooperate and thus enable groups to mitigate the free-rider problem.

Reddish, Bulbulia & Fischer (under review), constructed a minimalist laboratory study to find evidence of synchronous rituals effects on charitable giving in a 'natural' helping scenario. They also measured inclusion of self in others (IOS) (Aron, Aron & Smollan, 1992) to assess how close participants felt to each other and self reported measures of mood in an attempt to find underlying psychological variables modulating co-operation. In line with Wiltermuth & Heath (2009), Reddish et al.,

(under review) found a significant difference in levels of co-operation between the synchronous and no movement groups. In addition to these findings, their results also showed a generalised pro-social reaction to the synchrony intervention, not limited to in-group membership.

McNeil's (1994) 'muscular-bonding' hypothesis was not supported by Reddish et al., (under review) as their results suggested that experiences of group unity do not change depending upon the synchronous and asynchronous nature of the ritual. Nor did they find any difference in mood between the synchronous, and control conditions.

These experimental findings of Wiltermuth & Heath (2009) and Reddish et al., (under review) did not support the theorised link between ritual and heightened affect (see Durkheim, [1915] 1965; Collins, 2011; Haidt et al., 2008).

Based on these experimental findings, I do not expect to find that synchrony is related to positive affect (hypothesis 1a). I predict that synchrony will be associated with increased levels of group unity as suggested in McNeil's (1994) muscular bonding hypothesis and supported by the experimental studies of Lakens (2010) and Wiltermuth & Heath (2009) (hypothesis 1b). Furthermore, the current study predicts that pro-social behaviour will be higher in groups that use higher levels of synchronous movement in their rituals in line with the findings of Wiltermuth & Heath (2009) and Reddish et al., (under review) (hypothesis 1c).

Physicality

Physicality refers, in this study, to the level of physical exertion required by a ritualistic activity. Physicality is another salient variable in rituals that we can clearly see from the physical relaxation of a meditation circle, to the fervor of a Pentecostal church's song and dance, to the athleticism of a sports match.

It has been well known that regular physical activity brings affective benefits to individuals with depressive and anxious symptoms (Morgan 1985), which has been confirmed in recent studies (see Dimeo et al., 2001; Dunn, Trivedi, & O'Neal, 2001; Camacho et al., 1991). Many studies have also reported associations between physical exercise and improvement of various aspects such as self-esteem (Sonstroem & Morgan, 1989), vitality (Salmon, 2001), general well-being, and satisfaction with physical appearance (Paluska & Schwenk, 2000). Evidence also indicates that regular physical activity may protect against the development of depression (Pate et al., 1995; Raglin, 1990), or that physical inactivity might be a risk factor for depression (Farmer et al., 1998). At the physiological level, physical exertion has been shown to stimulate the release of endogenous opioids (endorphins) (Howlett et al. 1984; Seeger et al. 1984; Harbach et al. 2000; Madsen et al. 2007). In terms of psychology, endorphin release in the body is experienced as a mild opiate 'high', and a corresponding feeling of well-being, and light pain suppressor (Belluzzi & Stein 1977; Stephano et al. 2000). Hassmen, Koivula, & Uutela (2000) showed in a cross-sectional Finnish study that individuals who exercised at least two to three times a week experienced significantly less depression, anger, cynical distrust, and stress than those exercising less frequently or not at all. McGowan & Peirce (1991) also reported that participating in a single bout of exercise significantly reduced reported total mood disturbance, tension, depression, anger, and confusion in a group of 72 college-age students who

participated in one of three 75-min. activity classes (running, karate, weight lifting) compared to a lecture class (control subjects). Physiological releases of endorphins in response to physical activity have also been suggested to be involved in the processes of social bonding in primates (Keverne et al. 1989; Nelson & Panksepp, 1998). This effect has also been found in human populations by Hassmen, Koivula, & Uutela (2000) who demonstrated that those who exercise regularly experienced a higher sense of coherence and social integration than their less frequently exercising counterparts.

Building upon the literature linking endorphin release to affect and social cohesion, Cohen, Ejsmond-Frey, Knight, & Dunbar (2009) explored possible interaction effects between physicality and synchronicity of muscle movement. Using pain tolerance as a conventional non-invasive assay for endorphin release, Cohen et al. (2009) showed that synchronized training in a college rowing crew was associated with an increased endorphin surge compared with control groups carrying out a similar training regime alone. They speculated that these findings may explain the euphoric moods experienced during other social activities that are involved in social bonding.

Though many have hypothesized about the relationship between exercise and co-operation, no previous study (of which I am aware) has investigated the specific cooperative effects of activities involving high energetic arousal. Regardless of this scarcity of empirical evidence, physical exercise has been used in many interventions aimed at reducing criminal or delinquent behaviour. These interventions have been varied, from hard labour camps for adult offenders to Outward Bound programs for teenage delinquents (Correia, 1997). Criminal behaviour can be seen as an example of non-cooperative behaviour within society that has been addressed through the use of physical exercise in 'boot camp' type interventions. These interventions are based

largely upon the suggestion of some psychologists that exercise works to mature certain personality traits such as self-discipline, social adequacy, emotional security and stability, and optimism, all of which aid decreasing delinquency and antisocial orientation (Correia, 1997).

Given the findings on ritual and orthogonal findings on exercise, the present study hypothesises that the association between affect and ritual may arise from a combination of synchronous movement and energetic arousal. Therefore, I predict that physicality will be associated with increased positive affect (2a). Further hypotheses predict that physicality will be associated with increased levels of group unity as seen in primate (Keverne et al. 1989; Nelson & Panksepp, 1998) and human populations (Hassmen, Koivula, & Uutela, 2000) (2b). Extending these arguments to co-operation, I also predict that higher levels of physicality will be associated with increased co-operation within groups (Hypothesis 2c).

Religiosity

The meaning and sacred values attributed to rituals may be an important engine for the social-cognitive effects of rituals (Fischer et al., in press). The current study seeks to examine ritualistic context by differentiating between religious and secular groups. Religions are universal across very diverse cultures (Cohn & Klausner, 1962) and their associated rituals have been viewed as something eminently social, destined to excite, maintain or recreate certain mental states within the membership (Durkheim, [1915] 1965). Much has been written on the affect of religiosity on psychological and behavioural outcomes within the social sciences, and links have been consistently found between religiosity and affect (e.g., Emmons, 2005; Ben-Ze'ev, 2002), group

unity (e.g., Sosis & Ruffle, 2001; Douglas, 1966; Radcliffe-Brown, 1952), and pro-sociality (e.g., Bulbulia & Mahoney, 2008; Sosis & Ruffle, 2004). These findings suggest that it may be an important variable in rituals as not all rituals are religious in their nature.

Religion as a meaning system incorporates many variables. In the current study, these include, (1) religious affiliation to a group, (2) religious practice and (3) religious belief. Anthropologists such as Emile Durkheim include in the category of religious meaning systems, (4) sacred values, (5) sacred rituals, and (6) moral institutions. The convention of grouping sacred values, practices, and institutions under the category of "religion" has been adopted by evolutionary anthropologists, such as Scott Atran (see Atran, 2002; 2007; 2008) and by evolutionary historians such as David Sloan Wilson (see Wilson, 2002; 2008). For the purposes of this thesis, religious rituals are defined as social practices associated with a religious institution, as defined by Hoverd (2008).

Emmons (2005) has suggested that religion likely influences both the generation of emotion and the regulation of emotional responses. This regulation of emotional intensity, according to Ben-Ze'ev (2002), happens in three ways. Firstly, religiosity affects the meaningfulness that people attach to events in that perceptions of divine intervention in daily events will generate stronger than normal emotions and reactions to those events. Secondly, religiosity influences people's perceptions of deservingness of diverse situation and life events in a way that makes religious persons more accepting of their life circumstances. This lowered deservingness is typically associated with less intense emotional reactions (Francis, 2007). Thirdly, religious persons typically believe that God directs and controls everyday events. Personal control is positively associated with emotional intensity; thus, all things being equal, religious individuals may be insulated against the effects of negative emotions (Ben-

Ze'ev, 2002; Francis, 2007). These speculations have recently been supported by Francis (2007) is a study of 89 students in Wales who completed both the 'Oxford Happiness Inventory' and the 'Francis Scale of Attitude Toward Christianity'. The researchers found a significant correlation between the two lending support to the hypothesised link between religiosity and happiness. Further support for the theorised link between religiosity and affect has been found in literature on religion and mental health showing a positive relationship between the two (e.g., Francis, Robbins, & White, 2003). Although this effect depends on the definitions of both religion and mental health (Lewis & Cruise, 2006), the overall effect has been shown in meta-analyses to be robust (Hackney & Sanders, 2002) (also see: Bergin, 1991; Myers & Diener, 1995; Worthington, Kuru, McCullough & Sandage, 1996). Additionally, religiously based cognitions have been shown to have positive effects on feelings of wellbeing, health, and distress (Pargament, Kennell, Hathaway, Grevengoed, Newman & Jones, 1988; Levin, 1994; McIntosh, 1995).

Research into the hypothesis that religious practices foster group unity and cohesion has followed on from Durkheim (1995[1912]) with functionalist anthropologists arguing that religious rituals facilitate the expression and group affirmation of shared beliefs, norms, and values which in turn creates stability and harmony within the group (Douglas, 1966; Radcliffe-Brown, 1952). Parallel to this line of thinking, another group of researchers (e.g., Iannaccone, 1992; Irons, 2001; Sosis, 2000; 2003) have also begun to look at the functions of religious practices from an economic perspective. Their analyses suggest that efficient religions, with perfectly rational members, may benefit from costly and bizarre behavioural requirements and restrictions. Irons (2001) explains religious practices as 'hard-to-fake signs of commitment that signal to other members of a group that you believe in the same

ideals or ideologies and thus can be trusted, as behaviours such as abstinence from sex, tithing, and rigorous prayer routines are too costly for an individual to fake. Thus, they will only be performed if an individual truly believes in the religious doctrines and dogmas that give the behaviours meaning. Now coined the ‘commitment signalling theory’ (Sosis & Ruffle, 2004; Bulbulia & Sosis, 2011), the theory suggests that commitment signals act in a way as to promote intra-group cohesion and pro-social behaviours.

Most religious texts encourage pro-sociality and some also include beliefs in supernaturally powered beings that involve themselves in the judgement and intervention in social interaction (Norenzayan & Shariff, 2008). Additionally the costly religious behaviours that followers adhere to not only signal trustworthiness to the in-group, but the cooperative nature in of the behaviours themselves may play a part in societal/cultural survival and thus become reinforced by evolving beliefs (Atran & Norenzayan, 2004; Boyer, 2001).

This theory has been further discussed by Ginges, Hansen, & Norenzayan (2009) specifically in terms of the act of suicide attacks by members of religious groups as being the ultimate display of group co-operation. They suggest that these acts of ultimate co-operation may derive not just from a set of religious beliefs that glorify the selfless acts, but derive instead from religion’s ability to enhance commitment to coalitional identities (Atran, 2003; Irons, 2001) and within-group co-operation (Norenzayan & Shariff, 2008; Sosis & Ruffle, 2003) or parochial altruism (Choi & Bowles, 2007) via collective ritual. They coin the term ‘coalition commitment hypotheses’ to describe this link between ritual and co-operation and their studies showed that attendance of religious ceremonies, but not time spent in prayer predicted support for suicide attacks. Likewise, when they primed participants with religious

attendance they were more likely to conclude that specific acts of suicide attacks were extremely heroic.

This link between religiosity and co-operation, altruism, and pro-sociality has been found repeatedly in other empirical studies. Religious activity such as prayer and service attendance is associated with higher self-reported rates of charitable giving (Monsma, 2007; Brooks, 2006). Bulbulia & Mahoney (2008) found, using a modified version of the dictator and public goods economics games, significantly higher levels (nearly four times as high) of altruistic giving between New Zealand and Canadian Christians than between non-Christian New Zealanders. Sosis & Ruffle (2004) asked whether differences in religious commitments and behaviours modulated co-operation within and across groups. To measure co-operation they used a variation on the public goods economics game with participants from a collectivized kibbutzim. The results showed an increase in co-operative behaviours among religious kibbutzim compared with secular controls. These findings suggest that religiosity may be an important mechanism used by society to foster and maintain the virtuous behaviour of its citizens.

In a field study involving nine naturally occurring rituals, we previously found that the effects on co-operation of synchronous movements and group cohesion were mediated by the level of which participants felt that their ritual was sacred (Fischer et al., in press) [Also see Tanner, Ryt, & Hanselmann, 2009)]. We interpreted these findings as suggesting that when individuals feel their activity to be sacred, their motivational basis for co-operation is increased and thus partners are more easily able to predict cooperative exchanges. Although tenuous, the link between sacred values and religious affiliation finds support from Durkheim (1947) who defines religion as

'a unified system of beliefs and practices relative to sacred things' and thus Fischer et al., (in press) may be extended in the current study via the variable of religiosity.

Based on the literature, the current study hypothesises that the association between affect and ritual may be dependent upon the religious or secular context in which they take place such that higher levels of religiosity will increase positive affect as seen in the mental health literature (Hackney & Sanders, 2002) (Hypothesis 3a). Further hypotheses predict that religiosity will be associated with increased levels of group unity as suggested both by anthropology (Durkheim, 1995[1912]) and commitment signalling models (Sosis & Ruffle, 2004; Bulbulia & Sosis, 2011) (Hypothesis 3b). Furthermore, it is hypothesised that rituals in religious groups will show higher levels of pro-sociality in line with past findings of Monsma (2007), Brooks (2006), Bulbulia & Mahoney (2008), and Sosis & Ruffle (2004) (3c).

The current study

In a previous study, we examined rituals in terms of the variable of synchronous movement (Fischer et al., in press). The current study consider how three factors that are part of naturally occurring rituals inter-relate: (1) the level to which the movement of two or more individuals falls into a constant rhythmic relationship with one another – synchrony, (2) the presence of religious beliefs and values associated with the ritual activity, and (3) the level of physical exertion being demanded by the ritual. Unlike the previous study, the current study examines how rituals affect emotions. It does this by focussing on the associations between the synchrony, religiosity and physicality, at the level of participants' emotional experiences. These additional theoretical avenues of exploration, while also increasing both the number of

participants and the number of diverse, naturally occurring rituals included in the study, seek to provide important further insights into the science of rituals and their role in social evolution.

Method

Participants

A total of 194 participants from 18 different community groups participated. Mean age was 30.058 (S.D. = 14.393) and 55.2% were female. Of the sample, 74.2% identified themselves as New Zealand European while the rest of the participants identified themselves as being Asian (4.1%), Pacific Islander (1.5%), Maori (1.0%), and Other (18.0%). The 19 naturally occurring community groups sampled were: Hare Krishna Kirtan (n = 10), Batucada (n = 10), Capoeira (n = 12), Zumba (n = 12), Yoga (n = 14), Running Race (n = 3), Mega Danz (n = 11), Buddhist Meditation (n = 10), Men's Soccer Practice (n = 8), Women's Soccer Practice (n = 11), Men's Rugby Practice (n = 11), Men's Choir Practice (n = 12), Women's Choir Practice (n = 12), Shambhalla Meditation (n = 3), Book Club (n = 9), Church Youth Group (n = 13), Social Running Club (n = 18), Bible Study (n = 6), Raw Food Potluck Dinner (n = 9).

Measures

Demographics: Data was gathered on participant age, gender, and ethnicity.

Positive Affect: The study used a modified version of The International Positive and Negative Affect Schedule Short Form (I-PANAS-SF) (Thompson, 2007) to investigate affect diversity amongst participants. The PANAS (Positive and Negative

Affect Schedule) was developed by Watson, Clark, & Tellegen, (1988) as a 20-item scale and has been well validated and cited in several thousand research papers making it a standard for affect investigations in the social sciences. The PANAS-10 has been developed in order to combat the two drawbacks that have been claimed against the original 20-item scale in certain settings. The first drawback being that the original that was developed in the United States contained some North American colloquialisms that can be ambiguous to other English-speaking nationals (Crawford & Hendry, 2004). And secondly, although 20-items is a relatively short measure for many environments, the original PANAS has been found to be still quite long for studies involving numerous other variables or for use with time-constrained populations (Thompson, 2007). The current study used five of the items from the I-PANAS-SF that measured the positive affect dimension of the scale (alert, inspired, determined, attentive, and active) plus the additional item of 'happy' following Wiltermuth & Heath (2009). Participants were asked to think about how they feel right now and to indicate to what extent these feelings reflect you now. Ratings were given on a 7-point scale (1 = Not at all, 7 = Highly). Cronbach's alpha for the 6-item scale of positive affect was .795 in the pre-activity and .858 in the post-activity measure.

Group Unity: A measure of group unity was created by adapting items from the Multi-component Model of In-group Identification of Leach, et al., (2006) including: 'I am glad to be [In-group]' (Adapted from Cameron, 2004; Doosje et al., 1998; Luhtanen & Crocker, 1992.), and 'I often think about the fact that I am [In-group]' (Adapted from Cameron, 2004.). Additional items from Fischer et al., (in press) were also used to assess group unity; 'How well do the values of the group reflect your own values', and 'Would other people think that people doing this activity share some

common values and beliefs?’ Ratings were given on a 7-point scale (1 = Not at all, 7 = Very much).

The ‘Inclusion of Other in the Self’ (IOS) scale is a single-item pictorial that, according to Aron, Aron & Smollan (1992), is intended to tap directly people's sense of interpersonal interconnectedness (see figure 1).

Figure 1. The simple pictorial measure used in the current study as a self-report measure of ‘inclusion of self in others’ taken from Aron, Aron & Smollan (1992).

We summed all these items to form an overall group unity measure. Cronbach’s alpha for the 5-item scale of group unity was .735 in the pre-activity and .715 in the post-activity measure.

Co-operation: We used a public goods game as a measure of co-operation between in-group members. The public goods game, sometimes referred to as ‘common-pool resource’ games, is a standard measure used in behavioural economics to assess levels of co-operation (Wiltermuth & Heath, 2009; Bulbulia & Mahoney, 2008; Sosis & Ruffle, 2004). The current study used a variation of the game used by Wiltermuth &

Heath (2009) in which participants played in groups of 3-5 players without knowing whom they were grouped together with. Participants were told that they have been given \$5.00 that they are free to distribute in 50-cent increments between themselves and a 'public investment'. They will keep the full amount that they decided to keep for themselves, while all money put into the public investment will be doubled and distributed equally among the players. Prior to making the decision, each participant was given a list of different outcome examples. These examples made it clear that the socially optimum outcome would occur if all participants gave all of their money into the public investment, while the individually optimal outcome would occur when the participant kept all of their own tokens while the rest of the group gave theirs to the investment fund. Participant responses were given on a scale of \$0.00 to \$5.00 (1 to 10 in \$0.50 increments) for how much of the money they wanted to keep for themselves.

Procedure

Prior to the study, the researchers examined naturally occurring group rituals in Wellington, New Zealand for their diversity in terms of synchronicity of movement, religiosity, and physical exertion. Rituals were selected to be included in the study that varied along these three dimensions.

The author of the study contacted key persons within each of the community activities after finding them through either an internet search, a personal contact, or through word of mouth information. A general outline of the research was explained over the phone or email to the key contact person and a date was arranged for the researcher to come along to the group activity to gather the data. Signed consent for gathering data was gained from the key contact person when required. Depending on the activity,

participants were either invited individually as they walked in the entrance of the welcoming area (Hare Krishna Kirtan, Batucada, Capoeira, Zumba, Yoga, Running Race, Mega Danz, Men's Soccer Practice, Women's Soccer Practice, Men's Choir Practice, Women's Choir Practice, Social Running Club, Raw Food Potluck Dinner) or the group was addressed as a whole before their activity began (Buddhist Meditation, Men's Rugby Practice, Shambhalla Meditation, Book Club, Church Youth Group, Bible Study). Information about the study was provided both verbally and in print. Participation was voluntary. To keep confidentiality of the responses, participants were given a small (3cm x 3cm) square of paper with a capital letter printed on it, the participant was asked to write this letter on each page of the questionnaires and to keep it until the end on the activity. Each participant was then given the pre-activity questionnaire and a pen and asked to complete it before handing it back to the researcher. Participants then participated in the group activity as normal. During the activity, the researcher took notes at each five-minute interval of what the group was doing – this formed the basis of our coding strategy. Immediately following the end of the activity, participants completed the economics game (including a signed consent page) and then completed the post-activity questionnaire. Upon completion of the questionnaire, participants were handed their monetary reward for the economic game. Time constraints after the ritual posed significant challenges so that it was often unethical for participants to be forced to wait while their monetary rewards were calculated. Participants were therefore given the maximum monetary outcome from the economic game (\$10).

We explained to the participants during the debrief that due to time constraints on their time they would all be given the socially optimal amount of \$10 each. They were

then asked to sign a receipt for the money they were given and were also offered a printed debrief.

Coding

The current study wished to use exact group synchrony, physicality and religion as predictor variables of our dependent variables. A panel of psychology students, professors, and members of the public ($n = 40$) were used as independent coders through the use of an online survey. Each naturally occurring group ritual was made up of one to several sub-activities that each varied in terms of synchrony and physicality. For example, the Capoeira activity included a drill activity, a pair's game activity, and a group game activity. For each of these sub-activities, coders were given written descriptions of them, such as:

“Participants were divided into groups between approximately 6 different types of drums, those with the same type of drums stood next to each other and the group as a whole formed a large circle. The leader stood in the middle of the circle and commanded each group what to play and when to play different rhythms. The leader thus conducted the different drum groups together into a rhythmic pattern.”

In order to code for physical exertion, after reading the activity description (as above), each coder was asked; ‘How physically exerting do you consider this activity to be? (1 = very low physical exertion, 10 = very high physical exertion)’. The mean for each sub- activity was calculated across the ratings of the individual coders. The mean rating was then multiplied by the percentage of time that each sub-activity was performed for in relation to the ritual as a whole. These ratings were then added

together from each sub-activity to give a total score of physical exertion for the group activity.

The same sample of coders was then given the following definitions for three structurally different types of synchrony.

- 1 Exact synchrony: all participants in the group are performing the same movements to a shared rhythmic pattern.
- 2 Complimentary synchrony: participants perform full synchrony within sub-groups. Although each sub-group's movements are unique, they are complimentary to the overall rhythmic movement of the group as a whole (sub-groups may be made up of one or more participants).
- 3 No synchrony: participants perform movements independently and in their own accord.

Coders were then asked to rate how well each of the three definitions fitted the activity description on a scale of 1 – 10 (1 = poorly, 10 = very well). The mean for each type of synchrony was calculated for each sub-activity from the ratings of the individual coders. The mean rating was then multiplied by the percentage of time that each sub-activity was performed for in relation to the ritual as a whole. These ratings were then added together from each sub-activity to give a total score of each type of synchrony for the group activity.

When correlated against each other, it was found that 'exact synchrony' was negatively correlated with both 'complimentary synchrony' ($r(192) = -.44, p < .001$), and 'no synchrony' ($r(192) = -.78, p < .001$). In light of these strong and inverse

correlations, ‘exact synchrony’ was used as the sole measure of synchrony and was categorized into three levels. This was done by taking the mean coded ratings of exact synchrony of each group and dividing them, based on those mean ratings, into low ($< .33$), medium ($>.33 < .66$), and high ($> .66$).

The naturally occurring community groups were coded into two groups, religious and secular, based on whether or not they were part of an established religious practice or institution that used ‘culturally patterned interactions with culturally postulated superhuman beings’ (Spiro, 1966).

Religious		Secular
Bible Study	Book Club	Men's Soccer Practice
Youth Group	Potluck Dinner	Women's Soccer Practice
Hare Krishna Kirtan	Running Race	Men's Rugby Practice
Buddhist Meditation	Batucada	Yoga
Shambhalla Meditation	Choir Practice	Zumba
	Social Running	Mega Danz

Table 1. Sampled groups by levels of religiosity

Results

Positive Affect: Hierarchical regression analysis was used to test if exact synchrony (hypothesis 1a), religion (hypothesis 2a), and physicality (hypothesis 3a) predicted

participants' ratings of positive affect at time 2 while controlling for positive affect scores at time 1, age, and gender. At step 1 we entered positive affect scores at time 1. At step 2 we added age and gender. At step 3 we added synchrony, physicality and religion. At step 4 we added all the potential 2- way interactions of synchrony, physicality and religion. At step 5 we added the 3-way interaction of synchrony, physicality and religion.

The results of the regression indicated all predictors together explained 39.70% of the variance ($R^2 = .40$, $\Delta F(1,150) = 4.85$, $p < .05$) (see Table.2 for variance explained at each step). It was found at step three of the regression that physicality was associated with increased positive affect (standardized $\beta = .20$, $p < .05$) and also at step four (standardized $\beta = .23$, $p < .05$) supporting our hypothesis (3a). However, at step five when the three-way interaction of synchrony, physicality, and religiosity was added (discussed below), physicality no longer showed a main effect (standardized $\beta = .17$, $p = \text{n.s.}$). A main effect was found for religion at step five where it was associated with increased positive affect (standardized $\beta = .34$, $p < .01$) supporting our hypothesis (2a), while no significant main effects were found for synchrony (standardized $\beta = .09$, $p = \text{n.s.}$).

	<i>b</i>	<i>SE b</i>	β
<i>Step 1</i> Constant	2.316	.363	
Positive Affect (time 1)	.589	.077	.517*
<i>Step 2</i> Constant	2.130	.427	

	Positive Affect (time 1)	.591	.077	.519*
	Age	-.001	.005	-.007
	Gender	.340	.156	.149
<i>Step 3</i>	Constant	1.985	.442	
	Positive Affect (time 1)	.605	.075	.531*
	Age	.002	.006	.029
	Gender	.267	.162	.117
	Synchrony	.143	.106	.097
	Physicality	.306	.120	.204*
	Religiosity	.010	.197	.004
<i>Step 4</i>	Constant	2.068	.437	
	Positive Affect (time 1)	.571	.075	.502*
	Age	.004	.006	.056
	Gender	.203	.160	.089
	Synchrony	.051	.158	.035
	Physicality	.352	.163	.234*
	Religiosity	.573	.283	.220*

	Synchrony*Physicality	.260	.171	.161
	Synchrony*Religiosity	.471	.325	.182
	Physicality*Religiosity	.908	.368	.253*
<i>Step 5</i>	Constant	2.115	.432	
	Positive Affect (time 1)	.578	.074	.507*
	Age	.003	.006	.043
	Gender	.223	.158	.098
	Synchrony	.135	.160	.092
	Physicality	.256	.167	.171
	Religiosity	.892	.314	.343*
	Synchrony*Physicality	.107	.183	.066
	Synchrony*Religiosity	1.068	.420	.412*
	Physicality*Religiosity	1.287	.402	.358*
	Synchrony*Physicality*Religiosity	1.064	.483	.312*
	* $p \leq .05$			

Table 2. Multiple regression of Positive affect at time 2.

In the final step, the analysis showed significant interaction effects between synchrony and religion (standardized $\beta = .41, p < .05$) suggesting that higher levels of synchrony increase positive affect in religious groups (unstandardized $b = 1.54, t = 4.15, p < .001$) but not in secular groups (unstandardized $b = .26, t = 1.53, p = \text{n.s.}$) (see figure 2).

Figure 2. Graph showing the interaction effect of synchrony and religiosity on self report measures of positive affect.

The analysis also showed a significant interaction effect between physicality and religion (standardized $\beta = .36, p < .05$) suggesting that higher levels of physicality increase positive affect in religious groups (unstandardized $b = 1.23, t = 3.07, p < .01$) but not in secular groups (unstandardized $b = .14, t = .84, p = \text{n.s.}$) (see figure 4).

Figure 3. Graph showing the interaction effect of physical exertion and religiosity on self report measures of positive affect.

A 3-way interaction was also found between synchrony, physicality and religion (standardized $\beta = .312, p < .05$). To investigate this interaction, the data file was split by religion/secular. The interaction between synchrony and physicality was significant in the religious groups (standardized $\beta = .54, p < .05$) (see figure 4), but not in the secular groups (standardized $\beta = .08, p = \text{n.s.}$). This suggests that within religious groups, higher levels of physicality increase positive affect more when those groups are also using higher levels of synchrony (High Synchrony: unstandardized $b = 2.54, t = 8.39, p < .001$) (Mid Synchrony: unstandardized $b = 1.63, t = 5.84, p <$

.001) (Low Synchrony: unstandardized $b = .73$, $t = 5.29$, $p < .001$). None of the other effects were significant.

Figure 4. Graph showing the interaction effect of physical exertion and synchrony on self report measures of positive affect in religious groups only.

Unity: Hierarchical regression analysis was used to test if exact synchrony (hypothesis 1b), physicality (hypothesis 2b), and religion (hypothesis 3b) predicted participants' ratings of unity at time 2 while controlling for unity scores at time 1, age, and gender. Using the same statistical methodology as with positive affect, the results of the regression indicated the six predictors explained 67.1% of the variance ($R^2 = .671$, $\Delta F(1,149) = .548$, $p < .01$) (see Table 2 for variance explained at each step). It was found that at step five, contrary to our hypothesis (1b), exact synchrony was

associated with decreased unity ($\beta = -.17, p < .05$). It was also found that religion was associated with increased unity ($\beta = .19, p < .05$). No significant main effect was found for physicality (standardized $\beta = -.003, p = \text{n.s.}$).

		<i>B</i>	<i>SE b</i>	β
<i>Step 1</i>	Constant	1.625	.232	
	Inclusion of Self in Others (time 1)	.737	.046	.788*
<i>Step 2</i>	Constant	1.406	.296	
	Inclusion of Self in Others (time 1)	.740	.047	.791*
	Age	.004	.005	.044
	Gender	.125	.139	.045
<i>Step 3</i>	Constant	1.087	.309	
	Inclusion of Self in Others (time 1)	.721	.046	.770*
	Age	.009	.005	.098
	Gender	.279	.142	.101
	Synchrony	-.287	.094	-.160*
	Physicality	.068	.105	.037

	Religiosity	.369	.173	.118*
<i>Step 4</i>	Constant	1.185	.321	
	Inclusion of Self in Others (time 1)	.717	.046	.766*
	Age	.009	.005	.095
	Gender	.234	.141	.085
	Synchrony	-.275	.141	-.153
	Physicality	-.035	.146	-.019
	Religiosity	.692	.248	.221*
	Synchrony*Physicality	-.037	.152	-.019
	Synchrony*Religiosity	.270	.290	.087
	Physicality*Religiosity	.845	.324	.196*
	Inclusion of Self in Others (time 1)			
<i>Step 5</i>	Constant	1.158	.324	
	Inclusion of Self in Others (time 1)	.718	.046	.767*
	Age	.009	.005	.098
	Gender	.229	.142	.083
	Synchrony	-.302	.146	-.168*
	Physicality	-.005	.152	-.003

Religiosity	.597	.279	.191*
Synchrony*Physicality	.010	.166	.005
Synchrony*Religiosity	.093	.376	.030
Physicality*Religiosity	.729	.361	.169*
Synchrony*Physicality*Religiosity	-.320	.432	-.078

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* $p \leq .05$

Table 3. Multiple regression of unity at time 2.

In the final step, the analysis showed significant interaction effects between physicality and religion (standardized $\beta = .17$, $p < .05$) (see figure 5) suggesting that higher levels of physicality increase unity in religious groups (unstandardized $b = .72$, $t = 1.21$, $p = \text{n.s.}$) but not in secular groups (unstandardized $b = -.005$, $t = -.03$, $p = \text{n.s.}$). None of the other effects were significant.

Figure 5. Graph showing the interaction effect of physical exertion and religiosity on self report measures of intra-group unity.

Pro-sociality: Hierarchical regression analysis was used to test if exact synchrony (hypothesis 1c), physicality (hypothesis 2c), and religion (hypothesis 3c) predicted participants' decisions in the public goods game, while controlling for age, and gender. The results of the regression indicated all predictors together explained 11.14% of the variance in pro-sociality ($R^2 = .11$, $\Delta F(1,142) = 3.505$, $p = \text{n.s.}$) (see Table.3 for variance explained at each step). It was found at step three of the regression that synchrony was associated with increased pro-sociality (standardized $\beta = .28$, $p < .05$) supporting our hypothesis (1c). However, at step four when the interaction of synchrony and religiosity was added (discussed below), synchrony no longer showed a main effect (standardized $\beta = .22$, $p = \text{n.s.}$). No significant main

effects were found at step four for physicality (standardized $\beta = -.008$, $p = \text{n.s.}$) or for religion (standardized $\beta = -.23$, $p = \text{n.s.}$).

		<i>b</i>	<i>SE b</i>	β
<i>Step 1</i>	Constant	3.369	.649	
	Age	-.043	.016	-.214*
	Gender	-.282	.468	-.049
<i>Step 2</i>	Constant	3.274	.816	
	Age	-.039	.018	-.192*
	Gender	-.396	.500	-.068
	Synchrony	.221	.325	.059
	Physicality	.427	.369	.113
	Religiosity	-.044	.609	-.007
<i>Step 3</i>	Constant	3.599	.865	
	Age	-.034	.019	-.167
	Gender	-.426	.501	-.073
	Synchrony	1.043	.498	.281*

	Physicality	-.296	.518	-.078
	Religiosity	-.742	.876	-.113
	Synchrony*Physicality	-.902	.532	-.224
	Synchrony*Religiosity	-1.913	1.023	-.290
	Physicality*Religiosity	.902	1.182	.099
<i>Step 4</i>	Constant	3.351	.868	
	Age	-.030	.019	-.150
	Gender	-.465	.497	-.080
	Synchrony	.810	.509	.218
	Physicality	-.029	.533	-.008
	Religiosity	-1.534	.966	-.233
	Synchrony*Physicality	-.494	.570	-.123
	Synchrony*Religiosity	-3.480	1.315	-.528*
	Physicality*Religiosity	-.007	1.268	-.001
	Synchrony*Physicality*Religiosity	-2.857	1.526	-.330†

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* $p \leq .05$

† $p = .63$

Table 4. Multiple regression of public goods game.

The analysis showed a significant interaction effect between synchrony and religion (standardized $\beta = -.53, p < .01$) suggesting that higher levels of synchrony increased co-operation (lower scores in the public good game indicate more co-operation) in religious groups (unstandardized $b = -2.67, t = -2.17, p < .05$) but not in secular groups (unstandardized $b = .81, t = 1.59, p = \text{n.s.}$). A marginally significant 3-way interaction was also found between synchrony, physicality and religion (standardized $\beta = -.33, p = .06$). To investigate this interaction, the data file was split by religion/secular. The interaction between synchrony and physicality was significant in the religious groups (standardized $\beta = -.80, p < .01$), but not in the secular groups (standardized $\beta = -.14, p = \text{n.s.}$) (see figure 6). This suggests that within religious groups, higher levels of physicality are associated with higher levels of co-operation in groups that use high levels of synchrony (unstandardized $b = -2.45, t = -2.55, p < .05$) and lower levels of co-operation in groups that use low synchrony (unstandardized $b = 1.63, t = 5.84, p < .001$) (Mid Synchrony: unstandardized $b = .75, t = .28, p = \text{n.s.}$) None of the other effects were significant.

Figure 6. Graph showing the interaction effect of physical exertion and synchrony on public goods game choices in religious groups only (higher values indicate less co-operation).

Discussion

Overview of core contribution

The current study examined whether rituals affect group unity, mood and pro-sociality via combinations of synchronous muscle movement, high physical arousal, and religious context. Group rituals that use these three elementals are universal across geographically and temporally diverse cultures (see Ehrenreich, 2006; McNeill, 1995; Brown, 2004).

The results of the current study suggest that the psychological modulations of positive affect, perceived group unity, and pro-sociality in rituals exist primarily due to the religious context within which they are performed. Results have also shown that when used together in a religious context, rituals that use high levels of synchrony and physicality are associated with higher levels of positive affect and co-operation within groups. These findings may help to explain the expansion of charismatic religions in those regions of the world where there are lower levels of security (Norris & Inglehart, 2004). Previous research has noted that the antiquity and enduring popularity of religion raises an evolutionary “cost problem.” The forces of genetic and cultural evolution combine to build adaptive complexity. Though gene-culture co-evolution does not lead to perfect designs, selection is nevertheless a perfecting process. Where there is competition and variation, less efficient designs tend to be replaced by more efficient designs. Yet as mentioned above, whether religion results yields functional benefits for religious people is a hotly contested question. That religion is so highly conserved and nearly universal, however, suggests functional advantages of some kind or another.

Previous studies have focused on co-operation. If religion supports mutualistic exchange within communities then all things being equal we would expect religion to be more highly conserved in communities where the threats to mutualistic exchange are highest, or where the demands for such exchange are most pronounced. Functionalist’s theories therefore predict that religion will be most apparent among the poor, oppressed, and marginalized.

Costly signalling models improve on functionalist explanations by explaining the costs of religion as themselves functional designs that serve to signal cooperative commitments (Bulbulia, 2004). The present study improves on costly signalling in

two ways (1) by explaining the conservation of synchronous religious rituals and (2) by explaining the expansion of highly energetic rituals.

Synchrony: Previous research has demonstrated that moving together in time evokes cooperative sensibilities and enhances cooperative behaviours (Wiltermuth & Heath (2009); Reddish (2012); Fischer et al. (in press)). An important finding from our previous research is that sacred values tend to be associated with the strongest cooperative effects (Fischer et al., in press). This finding is important because it suggests a place for values - and in particular sacred values (attitudes that deem certain ends as intrinsically worthwhile, and worth respecting and protecting in their own right) - in the causal picture of how synchrony affects people in natural human ecologies. We found that it is not merely moving together in time, but moving together within a shared framework of sacred values that produces the strongest cooperative sentiments and behaviours. The present study examined sacred values in connection with religious traditions. Religious traditions are institutions that maintain and transmit sacred values from one generation to the next. In line with our sacred values research, we found that synchrony and religion combine to express the highest levels of co-operation and also positive affect. Our findings therefore help to explain the evolutionary conservation of the institutions that maintain and transmit sacred values throughout the generations. Our study suggests that synchrony is a missing piece in the evolutionary puzzle of religion.

Energetic arousal (physicality): Not only do our results identify synchrony as a missing piece of the evolutionary puzzle on religion, we fit this missing piece to a model in which energetic arousal amplifies the effects of affect, group unity and co-operation. The present study isolates physicality as an important component in a cooperative mechanism. Specifically, we found that co-operation and positive affect

are the greatest when synchrony and physicality are both used within a religious context, and that physicality also has an affect on group unity in religious contexts. Despite a frenzy of research in the synchrony literatures, it is not simply by moving together in synchrony that people become united, but by effortfully doing so, under the assumptions of shared framework of sacred values. Indeed, we found no significant effects in either affect, unity, or pro-social orientation outside of a religious context. These findings not only help to explain the strong conservation of religion, but also clarify why it is that specifically charismatic religions are thriving in communities that are most under threat worldwide.

Detailed consideration of this research

Affect: In line with our hypothesis (3a), religiosity was associated with increased levels of positive affect experienced by participants during rituals. Physicality also showed an association with increased levels of positive affect as suggested by our hypothesis (2a). However, this relationship disappeared when interactions with religiosity were included. Consistent with our hypothesis (1a), synchronous group movement was not associated with increased positive affect. Analysis of possible interaction effects between the three variables (synchrony, physicality, and religiosity) indicated that both synchronous movement and physicality were associated with higher levels of positive affect only in a religious context. The three-way interaction also showed that this effect is larger within religious contexts when both synchrony and physicality are used.

Our findings have shown that the regulation of positive affect during rituals that has been theorised by anthropologists (see Durkheim, [1915] (1965); Collins (2004)) is

moderated by the meaning context in which the activity is performed. The main effect of religiosity on positive affect found in the current study supports anthropology and suggests that individuals that participate in religious rituals feel happier, more inspired, attentive, alert, and active than those in secular activities. Previously, synchronous muscle movement has been examined as a potentially key variable associated with changes in affect during ritual. However, the current study's results suggest that the experimental work of both Wiltermuth & Heath (2009) and Reddish (2012) lack the variable of a meaning context that is present in naturally occurring rituals and therefore do not produce the effects that were described by anthropologists in the field. Our examination of religiosity as a key variable in determining psychological change during rituals supports the views of traditional anthropologists and suggest that experimental settings can be very limited in their ability to assess more subtle elements of ritualistic activity such as meaning context. This potential limitation of experimental research supports the value of the current naturalistic field studies, as variables such as religious meaning contexts can be difficult to replicate inside the laboratory. These results from the field also provide a degree of unity between anthropology and experimental psychology by showing that it is only a difference in depth of contextual exploration that differentiates the two results.

Our results show that both synchronous movement, and physical arousal, are associated with positive affect only when they are present within a context of religiosity. And while religiosity by itself does provide a positive affect on mood, the combination of highly arousing, synchronous movement within a religious context provides the greatest affective benefits to practitioners. These results provide a utilitarian explanation for the spread of charismatic religions throughout the world (Norris & Inglehart, 2004) that use both synchronous movement and high physical

arousal within a religious meaning context. According to the current study, ritualistic groups that use these three variables together act to elicit inherent affective pleasure within their members.

Our results also suggest that there is more to highly physically demanding religious practices than merely being ‘hard-to-fake’ signs of commitment to shared beliefs as claimed by Irons (2001), but that the physical cost in terms of energetic arousal channelled into religious rituals is important in eliciting positive emotions also. This is also shown by a phrase commonly used in the religious rituals sampled during this study that: ‘the more you give, the more you get out of it’. These findings provide scientific evidence that validates this claim as the more physical exertion given to the religious activity, the more pleasurable the emotions experienced are.

According to our results, emotional wellbeing is higher within religious groups than within their secular counterparts as suggested by Haidt et al. (2008) in his ‘hive hypothesis’ that claims that humans experience the greatest well-being when self-consciousness is reduced. Religiosity may provide a mechanism as described by Ben-Ze’ev (2002) which allows individuals to see themselves as being one of many pieces being directed as a whole by God. If this were the case then we would expect that religiosity would be associated not only with positive affect, but also with heightened perceptions of being part of a larger group as the current study hypothesises.

Unity: A number of theorists have claimed that the perception of being part of a larger whole is essential for individuals to flourish, including Durkheim’s ([1915] 1965) ‘moral community’, Haidt et al.’s., (2008) ‘hive hypothesis’, and the closely related theory of ‘communitas’ (Turner, [1969] 1995). Each of these theories suggest that the

communities with the greatest well-being use activities that allow self-consciousness to be reduced so that individuals merge into an identity greater than themselves. McNeill (1995) and Ehrenreich (2006) suggest that one of these techniques that enable individuals to feel part of something larger is synchronous movement. The current study has extrapolated out physical arousal and religious context as additional mechanisms that we hypothesize as facilitating the pursuit of group unity.

Contrary to our synchrony hypothesis, the current study found that participants feel more individual and unique during rituals that use higher levels of synchronous movement. Although these findings do not support the prior literature of McNeill (1995), Wildermuth & Health (2009), and Reddish et al., (in press), it should be noted that laboratory findings about synchrony and unity are relatively weak. Although Wildermuth & Health (2009) found an association between the two variables, it was notably only present when participants sang or when they sang and moved, and the association disappeared when movement was isolated. Similarly, Reddish (PhD dissertation, submitted) found only muted effects on group unity and pro sociality from synchrony conditions. Indeed in a chanting condition, it was only the asynchrony condition that led to greater charity and unity than the control condition (no chant). Subsequent studies revealed that it was the association of synchrony under certain collective assumptions about the goal of the activity that produced the strongest boosts to co-operation and perceived unity. These findings suggest that while synchrony is an important piece to the puzzle of how naturally occurring rituals affect us, synchronous movement alone is unlikely to enhance pro sociality and perceived unity. However, the sharing of collective assumptions does appear to affect social sensibilities and in this context of shared beliefs, synchronous movement may affect perceptions of social cohesion. This explanation finds support from

functionalist anthropologists who have suggested that feelings of group unity are facilitated by the affirmation of shared beliefs, norms, and values during ritual (Douglas, 1966; Radcliffe-Brown, 1952).

Irons (2001) has argued that a mechanism by which shared beliefs are affirmed is through the performance of costly behaviours that act as ‘hard-to-fake’ signs of commitment. Now coined the ‘commitment signalling theory’ (Sosis & Ruffle, 2004; Bulbulia & Sosis, 2011), the theory suggests that high cost behaviours signal commitment to shared values and thus promote intra-group cohesion and pro-social behaviours. Our findings suggest that costly physical arousal in of itself is not enough to foster feelings of group unity through either costly signals of commitment, or endorphin release. In the current study, physical arousal was found to only affect perceived group unity in religious groups. These findings suggest that religious context is important in providing a framework of values, beliefs, and ideologies that can then be affirmed through costly behaviours. Likewise, costly behaviours performed within rituals that are void of an established system of group values fail to act as an effective communication tool towards group cohesion. This may help to explain the prevalence of highly physical rituals used within religious groups such as pilgrimages, fervent song and dance, and self-mutilation.

However, religiosity, even without such costly behaviours are shown in our results to be strong predictors of group unity within ritual participants. This association between religiosity and perceived group unity even when rituals are void of physical arousal may still support the theories of Irons (2001), Sosis & Ruffle (2004), and Bulbulia & Sosis (2011) through other forms of costly signalling. Many religious groups encourage behavioural restrictions such as abstinence from sex, tithing, and prayer routines that are all very costly to the individual from an evolutionary and utilitarian

perspective. Abstinence from sex may in fact be the epitome of a low physically arousing behaviour and yet involves an extremely high cost to the individual in terms of procreation, relationship, and sensual pleasure. Based on the current findings, we could speculate that low arousal, but high cost behaviours (or lack of behaviour) do in fact provide an effective means by which in-group members signal their commitment to a shared set of values and beliefs and thus foster feelings of group unity.

Pro-sociality: A primary goal of the current study was to examine a possible explanation for how societies find and sustain longevity in the face of scarcity of resources and the self interests of individuals. We have therefore asked: “what mechanisms enable pro-social behaviours to endure, and how are they maintained over time?”

Anthropology and experimental psychology have both suggested that synchronous group movement during rituals increased cooperative behaviours within groups. However, evidence from naturalistic settings has shown that this relationship between synchrony and pro-sociality may be mediated by sacred values (Fischer et al., in press). Our results build on the findings of Fischer et al., (in press) showing that co-operation is increased by religiosity – religion being a carrier of sacred values. This adds important evidence to support the social value of religions and a reason for their prevalence and survival throughout history. Sceptics in social science have often derided religions and their associated rituals as having no functional value. Our findings support a growing body of research that shows positive individual and social outcomes for those who participate in religious groups. Our findings also suggest that previous experimental studies of ritual and co-operation have been weak in their narrow focus of only explicitly observable behavioural measures, lacking a great meaning context.

Our results show that rituals that have the greatest association with higher levels of social co-operation are those rituals that use both synchronous movement and high physical arousal within a religious context. These findings again provide an empirical explanation for the spread and survival of charismatic religions across the globe in which highly aroused participants engage in synchronous singing, dancing, and prayer within a religious context.

Limitations and Future directions

Field studies are important because they bring ecological validity to psychological science. However there are familiar trade-offs between ecological validity and experimental control. The present study is not exempt from these trade-offs. For example, we could not randomly assign participants into conditions. This fact impairs inferences from our dataset to wider populations. Though we found that physical arousal and synchronous movement within religious contexts is associated with higher levels of positive affect, group unity, and co-operation, the relationship of cause to effect is somewhat obscure. Might it turn out that people who are more cooperative or who are more prone to feeling connected with others seek out synchronous, energetic, religions? Perhaps. Though it is notable that joining a religion might not be as easy as joining a gym. The costly signalling literatures have argued that to be accepted and trusted within religious groups may require an individual to behave in ways that are very costly to the individual and therefore they can be seen to have high barriers to entry (Irons, 2001). A more likely bias for these samples comes from de-conversion. Namely those who are more likely to be affected

by religion and its rituals remain involved. Longitudinal studies might help to address causal questions that the present study, based on cross-sectional data, cannot answer.

The cross-sectional nature of the current study also limits us in our ability to know to what degree these psychological changes endure, or decay over time. Co-operative demands occur in the days and weeks that follow collective activities, yet the present study only measured co-operation immediately before and after such activities. Longitudinal studies would allow us to investigate and plot the nature and rate of decay in the positive affects found for mood, unity, and co-operation as time from the ritual increases. Malhortra (2010) demonstrated that the increased co-operative behavior found in religious individuals might only be present on days when those individuals visit their places of worship – this has been called the 'Sunday effect'. This Sunday effect may play an important role in the current study, not only in terms of co-operative inclination, but perhaps also in positive affect and perceptions of group unity. Therefore, further investigation is needed into the temporal decay of the effects found in the current study.

Another important direction for future research is the generalisation of the co-operative affects found in the current study. Reddish (PhD dissertation, submitted) has demonstrated in laboratory studies that the increased co-operation of within-group members due to collective ritual is also generalised to out-group individuals. This is a very important finding that needs to be explored further in naturalistic settings.

In the current study a basic public goods game was used as a behavioral measure of co-operation and pro-social orientation. Although these types of games have been readily used in the social science community to assess pro-sociality, there is no research to date that empirically shows the validity of public goods games to measure

pro-sociality. More research is needed to develop valid measures of pro-social orientation that can be used both in the laboratory and naturalistic settings to allow greater strength within studies, and also comparative analysis between studies.

Coding:

A key innovation of this study was its use of a more robust coding measure for synchrony. However the extend of improvement remains unknown. In the future, we would hope for automated analysis from video analysis to capture the dynamics both of synchrony and emotion to provide more objective and comparable measure of the variables. Similarly, technology such as heart rate monitors and skin conductance measures would allow for more accurate rating of physical arousal during activity. Future field studies would gain strength by using these technologies to advance the current study.

The current study coded for religiosity based on the ritual's being a part of an organized religion. This method of coding is limited in that an activity such as 'hatha yoga' is simply a stretching exercise to some participants while being an integral part of a yogic religious path for others. Future studies would benefit by assessing the meaning context of a ritual on an individual basis in terms of religious or spiritual value placed on the ritual by the individual. This method would provide more accurate data of the meaning contexts that individuals create around different activities and how these contexts then affect psychology and its change.

Applications:

The results of this study should find their application easily in social groups that require co-operation in order for sustainable longevity to occur. Free-riding and the tragedy of the commons exist at all levels of society from individual water usage, to the corporate control of our county's fisheries. Ritual and religiosity should now be seen as an ideal solution to dealing with the non-co-operative propensity within individuals. The application of group rituals within social groups provides a low cost method of improving both individual and social wellbeing through the growth of a co-operative propensity, improved group identity, and increased affective health.

The affects would be especially applicable within organizational settings where the need for co-operative efforts is critical for sustaining a high quality of productivity, relationships, and innovation. Organizations looking for a low cost solution to low moral, and social dissonance within its workers should find this research simple to apply by providing group activities that begin to foster a communal sense of sacred group values through philosophy classes or meditations, for example. It also suggests that to get the best out of one's work force, care must be taken to establish and foster a positive meaning context within which the work is done. Providing 'purpose' for high-end workers is becoming increasingly important for organizations to keep their staff in an ever increasingly transitory labour market. Group rituals and meaning contexts provide a strong solution to these human resource challenges.

The popular movement of grass-roots community projects being established is another social avenue in which our findings can find their application. Our findings support the need suggested by Sosis (2001) that communal living arrangements find increased longevity when they are within a shared religious context. All grass-roots initiatives

require a large amount of unpaid labour from members of the community. This means that opportunity for free-riding is very open and steps to encourage a co-operative group identity are needed. Simple group rituals are again a low cost, high impact method for fostering a positive psychology for community work ethic. Our results have also shown the necessity not only for the behavioral aspects of the rituals, but also for the shared meaning context behind them. Therefore, grass-roots groups must take steps also to foster a shared group of sacred values for the community and the work they are doing.

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Appendices

Appendix 1: Sampled groups

Hare Krishna Kirtan:

Kirtan is a form of yoga that involves the call and response chanting of Sanskrit mantras with musical accompaniment. The Kirtan was led by a team of three musicians with one of the leaders chanting the mantra and the others joining the audience's responding chant. The audience/participants would chant to the same mantra over and over again in one voice.

65% of the time: participants all sat on the floor facing a group of musicians and repeated the chant in a call and response fashion that was led by the lead musician in time to the music being performed.

35% of the time: participants danced down the main streets of the city in a line clapping and singing a repeating call and response chants being led a leader who played a drum. The dancing was all in time to the rhythmic drumming but individuals movements could be novel and unique although mostly participants all followed a similar skipping like dance style.

Group size: circa 20

Batucada:

Batucada is a sub-style of samba and refers to an African influenced Brazilian percussive style, usually performed by an ensemble, known as a Bateria. Batucada is characterized by its repetitive style and fast pace. In this group participants were divided in groups between approximately 6 different types of drums. Within their

group of drums they played in exact unison and while each group of drums played different rhythms they all worked together much like an orchestra.

50% of the time: Participants were divided into groups between approximately 6 different types of drums, those with the same type of drums stood next to each other and the group as a whole formed a large circle. The leader stood in the middle of the circle and commanded each group what to play and when to play different rhythms. The leader thus conducted the different drum groups together into a rhythmic pattern.

50% of the time: The leader stood at the front of the drumming group while the participants stood in 5 lines one behind another facing the leader. Conducted by the leader, the group played a number of 'songs' that they knew. While playing, participants would also perform a side step dance in time to the drumming and in unison with the leader, the dance involved moving weight from one leg to the other in time with the music.

Group size: circa 40

Capoeira:

Capoeira is a Brazilian martial art that combines elements of dance, and music. It was created in Brazil mainly by descendants of African slaves with Brazilian native influences, probably beginning in the 16th century. It is known by quick and complex moves, using mainly power, speed, and leverage for leg sweeps.

33% of the time: Participants all faced the front of the room in three long lines with the leader of the group at the front facing the participants. The leader would make commandments as to what combinations of movements were to be performed and the

participants would perform those movements a set number of times. Traditional music was played through a stereo and the performance of the participants was kept in time with the rhythm of the music.

33% of the time: Participants were put into pairs and were told to 'play'. This involved participants making rhythmic side-steps together with the music and in their own time performing manoeuvres such as a handstand or a kick towards the other player in a slow and rhythmic way. The other player would then make moves to evade the oncoming player and then perform a manoeuvre of their own. After each five minutes pairs would swap partners.

33% of the time: Participants all stood in a circle with three musicians at the head of the circle while everyone sang together and clapped in time with the music. Participants from the circle would step in the circle in pairs and 'play'. This involved participants making rhythmic side-steps together with the music and in their own time performing manoeuvres such as a handstand or a kick towards the other player in a slow and rhythmic way. The other player would then make moves to evade the oncoming player and then perform a manoeuvre of their own. After each two minutes pairs would swap with others from the circle.

Group size: circa 20

Zumba:

Zumba is a Latin dance inspired fitness program created by dancer and choreographer Alberto "Beto" Perez in Columbia during the 1990s. Zumba involves dance and aerobic elements. Zumba's choreography incorporates hip-hop, soca, samba, salsa,

merengue, mambo, martial arts, and some Bollywood and belly dance moves. Squats and lunges are also included.

100% of the time: Participants all stood facing the front of the class in lines with the leader on a stage at the front facing the participants. Loud music played from a stereo and throughout the class a number of different music styles are played. The leader of the group would command dance movements while also demonstrating the movements for the participants to follow. Each routine lasts for a round ten minutes before a new style of movement is begun in the same fashion. All of the movements are performed in unison and in time with the music.

Group size: circa 80

Hatha Yoga:

Hatha yoga, commonly referred to simply as 'yoga' in the West, is a system of postures, stretches, and breath work designed to make the body fit and supple in order that one may sit for long periods of time in meditation. In the West physical fitness and strength is typically the goal of yoga classes rather than enlightenment.

85% of the time: Participants were all on mats facing the front of the room where a leader is facing them with ambient music playing in the background. The leader of the group instructed breathing, movements, and postures while also demonstrating the motions for the participants to follow. Participants all followed the leader's postures in unison including their breathing. While in each posture the leader gave further instructions about the subtleties of each pose. Each pose required flexibility and strength to stay in.

15% of the time: Participants lay on their backs with eyes closed while a leader at the front of the room talked through a spoken relaxation sequence.

Group size: circa 20

Mega Dance:

Mega Danz is an exercise dance class combining many different styles of dance from Latin through to Hip-Hop. It is designed to create an aerobic workout through the use of contemporary dance moves.

100% of the time: Participants all stood facing the front of the class in lines with the leader on a stage at the front facing the participants. Loud music played from a stereo and throughout the class a number of different music styles are played. The leader of the group would command dance movements while also demonstrating the movements for the participants to follow. Each routine lasts for a round ten minutes before a new style of movement is begun in the same fashion. All of the movements are performed in unison and in time with the music.

Group size: circa 30

Soccer Practice:

15% of the time participants ran around the circumference of the playing field at a speed of their choosing.

35% of the time: a number of running and ball skill drills were ran by the coach such as:

- Sprints between two cones: Participants were divided into four groups of four. Each group competed against the other groups in a relay race between two cones. Each participant ran from one cone to another and back again, a distance of forty meters.
- Passing practice: Participants lined up at four corners of a square. At the instruction of the leader, participants took turns to run with a ball and then passing it to another participant. A number of different running and passing formations were performed according to the instructions of the leader.

50% of the time: participants were split into two groups and played a game of soccer.

Group size: circa 20

Rugby Practice:

15% of the time: participants ran around the circumference of the playing field at a speed of their choosing.

35% of the time: a number of running and ball skill drills were ran by the coach such as:

- Sprints between two cones: participants were put into four groups who competed against each other to run a relay between the cones.
- Passing practice: participants were put into different formations where they ran with the ball before passing to another participant.

- Backline manoeuvre: Participants were lined up across a field and the ball was then passed quickly between each person while running forward until the ball reached the end of the line. The line would then reassemble and the ball would be passed back the other way in the same manner.
- Line out: participants lined up in two lines a few meters apart from each other, a ball was then thrown down the middle of the two lines above the players heads and some of the players were lifted by others to compete for the ball.

50% of the time: participants were split into two groups and a game of rugby was played although heavy contact was avoided but rather the coach would call out when a ‘tackle’ was made and the player with the ball would fall to ground.

Group size: circa 20

Orpheus Choir Practice:

The Orpheus Choir is New Zealand’s premier symphonic choir of around 100 voices. They perform regularly at major Wellington music venues with highly regarded musicians and soloists, both international and local. Their concerts cover the major classic choral works, through to contemporary and challenging works, including new and original music by New Zealand composers. They have also covered musical styles from Opera through Jazz to Broadway show music.

25% of the time: Vocal warm ups were performed by the group at the direction of the leader. These warm ups were done in unison with participants standing in a tiered semi-circle. Each exercise would involve participants singing either a short song, or a

scale. The participants split themselves into four groups (bass, tenor, alto, soprano) for the songs so that each group sang the same words and rhythm, but in a different melody. Each group's diverse melody was complimentary to the sound as a whole.

75% of the time: the leader instructed the participants as to the song that they would be working on with the accompaniment of a piano. The participants split themselves into four groups (bass, tenor, alto, soprano) for the songs so that each group sang the same words and rhythm, but in a different melody. Each group's diverse melody was complimentary to the sound as a whole. At moments during the practice the leader would stop the choir and work with one of the groups for a few minutes before resuming the entire choir.

Group size: circa 40

Book Club Meeting:

This was a small group of people who get together on an irregular basis to share the books they are currently reading. During this activity participants ate some finger foods that each of them had bought along and some drinks also.

100% of the time: Each participant in the group was given a turn to spend around twenty minutes sharing about a book they were reading, why they liked it, and some of its themes. During the presentation time the listeners often asked questions of the presenter. Participants all sat in a circle on chairs around a small table.

Group size: circa 8

Youth Group:

This was youth group of high school ages participants run out of a Presbyterian Church in Wellington.

75% of the time: beforehand it seemed that groups of participants had organised and practiced a number of different skits or performances and during this time they performed them on a stage in front of the other participants who were all seated on chairs facing the stage. Each performance lasted around 10 minutes and was followed by applause and often interrupted with laughter and/or cheering.

15% of the time: A game was played where participants all lay on the ground in their own space while one participant walked around them. At the point at which one of the participants was touched on their head they then got up and chased the walking participant. For the majority of this game the participants were lying down together in their own space, it was broken up by small bursts of activity.

Group size: circa 40

Bible Study:

This was a small bible study group run out of a home in Wellington, New Zealand and was affiliated with a community group dinner project that is run each week from that house. The leaders of the project are Christians and so this bible study group was a further 'outreach' program for them.

25% of the time: A leader with a guitar played some songs and participants sang along, a short explanation of the inspiration behind the song was given at the start of each song. Participants were all seated in chairs in a circle around a small table.

75% of the time: A leader gave a reading from the bible and then each person was given a chance to share their thoughts about it while the others listened and interjected when they thought appropriate. Three passages were read all up. Participants were all seated in chairs in a circle around a small table.

Group size: circa 10

Potluck Dinner:

This was a community raw-food potluck dinner in which participants either brought a prepared plate along or else a collection of ingredients that were then used to create plates with other participants.

50% of the time: During this time participants arrived and mingled socially with other participants. Participants often joined in with helping to make a food dish with others. During this time juices were shared around and some small snack foods.

50% of the time: During this time participants served each other food and ate while having conversations with a number of different people sitting around them. Participants were all seated in a circle.

Group size: circa 20

Shambhalla Buddhist Meditation:

Participants entered into meditation room and sat on cushions in rows facing the front. Cushion at front at which person leading meditation with 'gong' (actually a stick in a resonating metal bowl) sits facing meditators. Decorated with symbols of Shambhalla

on walls and on a small alter at the front of the room. Pictures of the Shambhalla leaders at the front, candles, incense.

65% of the time: Participants sat in silence with crossed legs and erect spine. They were instructed to concentrate on their breath with eyes open. Participants sat on cushions facing the front of the room.

35% of the time: Participants walked clockwise around the edge of the room in an erect posture with left hand covering right fist. They walked in silence concentrating on sensation of feet on floor.

Group size: circa 5

Running Race:

This was a competitive national road running race around the Wellington water front.

100% of the time: Participants ran in a competitive national road race around the city.

Group size: circa 100

Wellington Buddhist Meditation:

50% of the time: Participants walked around the room chanting a mantra in unison. Participants, at their own discretion, would leave the walking circle to kneel beside the deity, light a candle and say a short prayer.

50% of the time: during this time participants sat in a semi-circle facing the deity while chanting a call and response mantra in unison led by a leader (same as Kirtan).

Group size: circa 10

Club Running:

This was a social club running event in which the large club group was divided into smaller groups of around 15 runners who all went on different running courses according to difficulty.

100% of the time: Participants ran socially in groups around a set course. Some participants talked while running, sometimes in pairs or small groups, or by themselves within a larger group.

Group size: circa 15

Appendix 2: Information sheet

Dear Participant,

This research examines how group activities affect attitudes and beliefs. If you agree to participate in this study you will be asked to complete two short questionnaires, one beforehand and one after your group activity. Included in the post survey is a small, written game from which you will be gifted around \$10 depending on the outcome of the game. The questionnaire should take no longer than 5 minutes to complete. There are no right or wrong answers, I am interested in your spontaneous reactions to the questions and statements. This research has been approved by the University ethics committee.

Before you take part in this research, please feel free to ask any questions that you may have. The questionnaire is completely confidential and your participation is entirely voluntary. You may know some of the researchers, but you should not feel obligation to participate due to you knowing the researchers. If you wish, you may withdraw from the study at any time before submitting the questionnaire. All completed questionnaires will be stored for five years following publication and then will be destroyed.

Dr. Ronald Fischer from the School of Psychology will hold electronic copies of the data indefinitely for archival purposes. In accordance with American Psychological Association guidelines, the confidential data may be shared with other competent professionals. In addition, the results of this research may form part of a Masters research project that will be submitted for assessment and may be submitted for publication in an academic journal or in a book.

If you are interested in the outcome of this research or in the research in general, please feel free to contact me. The results of the study will be posted on the following website: www.vuw.ac.nz/cacr/ at the end of this year.

Thank you for considering participation in this research.

Dr Ronald Fischer

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Appendix 3: Pre-activity survey

- 4) What is your age : Years:
- 5) What gender do you identify as? (please circle): Female / Male / Other
- 6) What ethnicity are you?
- ☐ Maori
  - ☐ NZ European/ Pakeha
  - ☐ Pasifika/ Pacific Islander
  - ☐ Asian
  - ☐ Other: _____

- 1) Thinking about *how you feel right now*, please indicate *to what extent these feelings reflect you now*.

	Not at All			Somewhat			Highly	
Upset	1	2	3	4	5	6	7	
Hostile	1	2	3	4	5	6	7	
Alert	1	2	3	4	5	6	7	
Ashamed	1	2	3	4	5	6	7	
Inspired	1	2	3	4	5	6	7	

Nervous	1	2	3	4	5	6	7
Determined	1	2	3	4	5	6	7
Attentive	1	2	3	4	5	6	7
Afraid	1	2	3	4	5	6	7
Happy	1	2	3	4	5	6	7
Active	1	2	3	4	5	6	7

---

2) Please rate how strongly you agree or disagree with the following statements
about *the activity you are about to do*:

Not at all	Very Much						
How well do the values of the group reflect your own values?	1	2	3	4	5	6	7
Would other people think that people doing this activity share some common values and beliefs?	1	2	3	4	5	6	7
I am glad to be in this Club Running	1	2	3	4	5	6	7
I often think about the fact that I am in this Club Running	1	2	3	4	5	6	7

- 3) Please circle the letter that *best represents how close you currently feel* to the group of people you are about to take part in [insert name of activity] with:

Self Group A	Self Group B	Self Group C	
Self Group D	Self Group E	Self Group F	Self Group G

Appendix 4: Public goods economic game

The following task is an economic game.

- 7) For the following game you will be gifted actual money equal to the amounts indicated in the game. There will be 3-5 other anonymous people playing this game. The money will be given to you in a private and confidential manner after the completion of the following survey. None of the other participants will know your decision.

You have been given 10 tokens, each worth 50 cents, which you are free to distribute between keeping for yourself, and giving to the 'public investment'. For the tokens you keep for yourself you will receive their full value, while all money put into the public investment will be doubled and then shared equally between the 3-5 players. At the end of the game you will get to keep all of the money you have kept for yourself and also your share of the public investment. The following examples are based on a 5 player game.

- 1 - If everyone gives all of their money into the 'public investment', everyone will receive \$10.00 each.
- 2 - If everyone keeps all their money for themselves then everyone will receive \$5.00 each.
- 3 - If everyone gives all of their money into the 'public investment', but you keep all of your own money you will receive \$13.00 and everyone else will receive \$8.00.
- 4 - If everyone keeps all their money for themselves, but you put all of your money into the 'public investment' then you will receive \$2.00 and everyone

else will receive \$7.00.

Remember that you can distribute your 10 tokens in any combination between the ‘public investment’ and yourself.

Statement of consent

I have read the information about this research and any questions I wanted to ask have been answered to my satisfaction.

I agree to participate in this research. I understand that I can withdraw my consent at any time prior to the end of my participation.

I understand the rules of this game and accept the amount I will earn.

Name: _____

Signature: _____

Date: [insert date of activity] PLEASE TURN PAGE OVER

Remember that you only have 10 tokens to distribute, each worth 50cents.

Please circle how many tokens would you like *to keep for yourself?*

\$0.00	\$0.50	\$1.00	\$1.50	\$2.00	\$2.50	\$3.00	\$3.50	\$4.50	\$4.50	\$5.00
(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

Appendix 5: Post-activity survey

- 1) Thinking about *how you feel right now*, please indicate *to what extent these feelings reflect you now*.

	Not at All			Somewhat			Highly	
Upset	1	2	3	4	5	6	7	
Hostile	1	2	3	4	5	6	7	
Alert	1	2	3	4	5	6	7	
Ashamed	1	2	3	4	5	6	7	
Inspired	1	2	3	4	5	6	7	
Nervous	1	2	3	4	5	6	7	
Determined	1	2	3	4	5	6	7	
Attentive	1	2	3	4	5	6	7	
Afraid	1	2	3	4	5	6	7	
Happy	1	2	3	4	5	6	7	
Active	1	2	3	4	5	6	7	

- 2) Please rate how strongly you agree or disagree with the following statements
about *the activity you have just taken part in*:

Not at all	Very Much						
How well do the values of the group reflect your own values?	1	2	3	4	5	6	7
Would other people think that people doing this activity share some common values and beliefs?	1	2	3	4	5	6	7
I am glad to be in this Club Running	1	2	3	4	5	6	7
I often think about the fact that I am in this Club Running	1	2	3	4	5	6	7

- 3) Please circle the letter that *best represents how close you currently feel* to the group of people you *have just taken part in this activity with*:

Self Group A	Self Group B	Self Group C	
Self Group D	Self Group E	Self Group F	Self Group G

Appendix 6: Receipt

I have received **\$10** as part of study conducted by Rohan Callander under supervision of Dr Ronald Fischer on the [insert date of activity]. This signature will in no way be linked to the data gathered from the survey. It is kept only for Victoria University auditing.

Name: _____

Signature: _____

Date: **[insert date of activity]**

Appendix 7: Debrief sheet

Thank you for participating in this experiment.

People in most cultures around the world join together to dance, sing, chant, march, and worship in synchrony with each other. Furthermore, performers also often hold these activities as very important and sacred. But why are these activities so common and personally important? Have synchronized activities developed and been preserved in cultures because they are beneficial in some way?

The present study examined the theory that synchronized group activities are a way of joining people together to help us live harmoniously in groups. When moving together with other people you expand your sense of self and become more 'other people' focused. This could result in increased pro-social behaviours such as helpfulness, kindness, and co-operation.

We tested whether participation in-group activities that involve some level of behavioural synchrony changes your feelings and thoughts about the group. We asked you the same question before and after your group activity to whether participating in your activity made you feel closer to others in the group. You also played a 'Public Goods Game' in which you were gifted some money. There was no deception involved and you got the money that you decided to keep for yourself plus the share that was available in the public pool. This is an indicator of how much people in your group trusted each other. Obviously, if you all trust each other, then all would have contributed their tokens and maximized the group's money in return.

This project will help in understanding what influences humans to help each other and to act in ways that are beneficial to others. If synchronized activities are found to increase pro-social tendencies in people, certain group activities could be encouraged to help in creating a more harmonious society.

If you have any additional questions or comments about this study, please feel free to contact Rohan Callander at rohan.callander@vuw.ac.nz or Dr Ronald Fischer ronald.fischer@vuw.ac.nz.

Thank you again for your participation in this research.