

Fasting Effects on Emotion Changes – A Multi-Level Analyses

Khairul Anwar Mastor¹, Kenneth Locke², Hasnan Kasan¹

¹ Center for Liberal Studies, Universiti Kebangsaan Malaysia 43600 Bangi, Selangor, Malaysia

² Department of Psychology & Communication Studies, University of Idaho MS 3043, Moscow, Idaho 83844-3043, USA

Abstract

Purpose: Psychological effects of a long term fasting has not yet been widely studied as compared to its medical and physiological effects. Little attention has been given to the psychological effects such as emotion due to fasting. Based on current emotion theories, emotion arouses and changes corresponding to the experience one undergoing. Ramadan fasting is a thirty day intermittent fasting which likely affects the emotion of those observing the fasting. In the present study, it was hypothesized that fasting may induce changes in positive and negative emotion throughout thirty days in Ramadan

Methodology: A total of 164 undergraduate students participated in the study (117 muslims who fast and 47 non-muslims as a control group - not fasting). A daily self-report on emotion was taken in separate three time periods – before, during and after Ramadan - among participants. A Mixed Model Analyses was used to analyze the pattern of emotion changes a week before, during and a week after Ramadan fasting period

Results: Emotion of jealousy was found to increase ($b=.02$) before Ramadan begins. During Ramadan, Happy and Joy increases ($b=.008$ and $b=.010$ respectively) while impatience, moody and sadness decrease ($b=-.007$, $b=-.007$ and $b=-.007$ respectively). A week after Ramadan ends, levels of happy and joy decrease (-0.008 and $-.012$) while levels of Fear, Impatience and Moody increase during the first week after Ramadan ends, respectively ($b=.018$, $b=.006$ and $b=.002$). There were also no significant interaction effects between day*gender and day*religion on the emotion mean scores.

Applications/Originality/Value: Further studies are recommended to conduct face-to-face interviews and more specific time of emotion record and other possible correlates that might influence the pattern of emotion changes to enhance our understanding of the psychological benefits of religiously based fasting.

INTRODUCTION

Fasting is an act of not taking food and drinks for a certain period of time. By that nature, it is logical to assume that fasting is likely to have some effects on physiological and biological aspects of human body. Thus, research on medical and health consequences of fasting have widely been conducted such as the effects of fasting on sexual hormones (Bahreyni et al., 2015), pattern on nutrients (Akhoundan et al., 2015), on lipid profile and dietary pattern (Pirsaheb et al, 2013), on spirometric values and clinical symptoms in asthmatic participants (Norouzy et al., 2013), on thyroid hormones (Bahreyni et al., 2013), on biochemical substances (Khoshdei et al., 2013) and many other earlier studies. Mesbahzadeh et al (2005) found that testosterone level was lower in Ramadan that explains the decrease sexual activities among husband-wife. Also, numerous studies have reported significant weight loss during Ramadan (Adlouni, Ghalim, Benslimane, Lecerf, & Saile, 1997; Adlouni et al., 1998; Fedail, Murphy, Salih, Bolton, & Harvey, 1982). Loss of body fat would indicate the use of fat for energy production during Ramadan (Husain, Duncan, Cheah, & Ch'ng, 1987; Ramadan et al., 1999; Sweileh et al., 1992). In addition, researchers have also found decreased heart rate and oxygen consumption during Ramadan (Husain et al., 1987; Ramadan et al., 1999; Sweileh et al., 1992). It seems that during the Ramadan daylight hours - when no food or

water is taken in - the metabolism slows down as to conserve stored energy, a metabolic adaptation to fasting (Sweileh et al., 1992).

So far the previous studies, in general, have provided almost many supports to the positive fasting effects on physical and biological body. On the other hand, relatively less studies have been done on the effects of fasting on psychological attributes including emotion. A search on *Journal of Fasting and Health*, a journal focus on fasting, database from 2011- 2015 indicated that the number of studies on physical and medical effects of fasting overwhelmingly outnumbered the psychological aspects. One recent study by Mousavi et al. (2015) on the effects of fasting on happiness is of much relevant here. In this study, they used pretest-posttest analysis to compare the happiness level among 110 respondents of Keramin, Iran during before and after Ramadan. Using the MUNSH happiness survey with four scales of positive appreciation (PA), positive experience (PE), negative appreciation (NA) and negative experience (NE), they found a significant difference between the level of happiness before and after the month of Ramadan. Moreover, there was a significant difference between the pre-test and post-test in terms of NA and NE. However, no significant difference was observed in the PA and PE before and after Ramadan. Overall findings, somehow, support the beneficial effects of fasting on happiness, as one aspect of psychological attributes. More new studies are therefore recommended.

In the present study, we have two major aims. First, we will examine the pattern of emotion changes, within-person and between-person from a week before, during, and a week after Ramadan. Second, we will examine the effect of gender and religious affiliation on the pattern and rate of the changes in positive and negative emotion throughout three durations as mentioned before.

To date, previous studies on the effects of fasting either on physiological and biological or psychological aspects were mainly cross-sectional and thus a complete picture on the effects of fasting on emotion changes day-by-day in Ramadan remain unexplored. Thus, we will employ multi-level analyses technique, a better approach where days of fasting are treated as predictors on emotion and allows to study pattern of emotion changes over a 30 day period.

Previous studies on fasting

Literatures about fasting in Ramadan are now widely available – from descriptive, narrative-type of discussion to the findings based on valid and reliable research work. Fasting is one of the important religious obligations in Islam. In the *Encyclopedia on Islam*, Esposito (2003, p. 64) explains:

“In Islam fasting is required during Ramadan, the ninth month of the Muslim lunar calendar, during which all Muslims are required to abstain during daylight hours from eating, drinking, or engaging in sexual activity. Through heightened awareness of their bodily needs, Muslims come to greater awareness of the presence of God and acknowledge gratitude for God’s provisions in their lives. Abstinence during Ramadan is required of all Muslims, except children, those who are ill or too elderly, those who are traveling, and women who are menstruating, have just given birth, or are breastfeeding. In such cases, one may make up days of fasting at a later time. Various traditions recommend voluntary fasting: the fast of Ashura (tenth day of the month of Muharram); fasting for six days in Shawwal, the month after Ramadan; fasting three days of each month and fasting on Mondays and Thursdays.”

Generally, restraining oneself from taking food, drinks and sexual relationship during a long fasting period is not easy and most likely, emotionally unpleasant. Not only that, they should refrain from talking bad about others, looking at bad things by any means (via internet, pictures or other forms) and involve in doing or making sins. On one hand, fasting seems to cause arousal

of negative emotions such as anger, moody, stubborn and impatience because of not being allowed to eat, drink or doing bad things. Sometimes, one may also feel sad or irritated probably due to their thought that life in Ramadan month is too restrictive. Kadri et al (2000) conducted study among smokers during Ramadan month. They found that irritability was higher among smokers in Ramadan since they were forced to follow religious injunction not to smoke despite their urge to smoke. They also found that people were more irritable at the end of Ramadan. In the other study, Roky et al (2003) noted that Ramadan subjective alertness decreased only at the beginning and not at the end of Ramadan, suggesting possibility of an adaptation mechanism to intermittent fasting. This might explain why people were more irritable that they were more alert of the many prohibitive actions during Ramadan.

However, for those are more religious and good practicing Muslims, fasting could cause one to be more disciplined, more patience, and calm. We assumed this kind of people realize fasting is an act of obedience to God, to please Him which is admirable and divinely blessed. So, even they were hungry and getting weaker, the aroused emotions were happiness and joy, and not the negative ones – that their fasting is more of an act to please God. Thus, during fasting period, people usually differ in their emotional reaction towards many stimulus – some may experience more positive mood and tranquility while some may also feels uneasy, impatience and easily irritated even during fasting – pending on their level of religiousness and piety. Although we did not measure religiosity of the samples, in the present study, we hypothesize that pattern of emotion changes might vary between individuals and emotional experience is more felt during and after the Ramadan rather than before Ramadan begins.

Why people get more irritated when the stomach is empty? One study helps explain why fasting may cause one to become more irritable although the following study was not really on religious-based fasting. Cartensen et al (2006) studied the effects of starvation (as equal to fasting) on subjects over several months, and some interesting psychological reactions were noted – including increase of upset and irritable, fighting with each other and their girlfriends. The men appeared apathetic and lethargic and seemed to lose interest in sex. Such condition is likely to lead to irritable. Further, the changes in meal and activity schedules during the month of Ramadan induce chronobiological and metabolic modifications, and also related to behavioral changes have been attributed to the abstinence from nicotine and coffee (Kadri et al. 2000). The declines may result from water loss early in Ramadan and loss of body fat during the later period (Sweileh et al., 1992). Afifi (1997) investigated that most individuals who recited al-Quran during Ramadan reported that they were more patience and feel more calm. Fasting is thus, likely to develop patience and calmness within individuals.

Thus, it is not merely fasting itself that influence emotion, but also the types of religious activities involved during fasting may also affect emotion changes and experiences. However, in the present study, we did not include correlates that might influence the emotion changes since we were only interested in looking into the pattern of emotion changes as outlined in aims of the study.

Based on this, we expect individuals who fast with full devotion and sincerity would be happier, more patience, more obedient and joyful being in the fasting month. On the other hand, those who fast but devoid of internal close bonding with God, would find themselves more impatience, easily get angry, impatience, moody, jealous, sad and probably, more fearful. In short, the true essence of fasting from religious point of view is to develop an ability to control passion and impulsivity, leading towards experiencing more positive affects than the negative ones.

RESEARCH QUESTIONS

Based on literature, we expect days in Ramadan to predict individual differences in levels of emotion. The current study was designed to answer three questions: (1) Do sample-level pattern of positive and negative emotion change over days in Ramadan among fasting and non-fasting individuals? (2) Do such pattern of emotion change vary across individuals, consistent with the principle of individual differences in intra-individual change? (3) Can certain variables (gender and religion) account for some of the variability in the pattern of change? The study is a longitudinal study designed to examine emotional changes involved during the period of fasting.

METHOD

Participants

The participants were 164 undergraduate volunteers (122 females, 42 males; 117 Muslim, 47 non-Muslim; M age = 21.6 years, SD = 4.5 years) attending the Universiti Kebangsaan Malaysia. All participants were free of chronic medical conditions (e.g., cardiovascular disease, diabetes) and received extra course credit for participating.

Materials and Procedure

Each participant received a booklet to record their daily emotions and attitudes. Participants completed one daily report of emotions and attitudes during each of the 9 days prior to the start of Ramadan, the 30 days of Ramadan, and the 30 days following the end of Ramadan; however, approximately half of the sample ($n = 83$) did not join the study until the Ramadan period. Fasting participants typically refrain from eating or drinking between sunrise and sunset; therefore, in order to assess emotions experienced during fasting, we asked all participants to complete their daily report between 3:00 PM and sunset. Each daily report asked participants to indicate how strongly they had experienced 10 emotions and two attitudes during that day on a 6-point scale ranging from 1 (*very low*) to 6 (*very high*). The 10 emotions were *happy*, *joyful*, *patient*, *calm*, *jealous*, *sad*, *impatient*, *moody*, *angry*, and *fearful*; the two attitudes were *stubborn* and *obedient*. The participants were encouraged to report their emotions accurately and honestly, without concern for social desirability. All materials were presented in Malay.

RESULTS

Analyses

Because each participant provided emotion ratings at multiple time points, we analyzed the data using multilevel (random coefficient) modeling (Nezlek, 1991; West, Ryu, Kwok, & Cham, 2011). At the within-person or daily report level (Level-1) we estimated, for each participant, the outcomes of interest (emotions and attitudes) whether those outcomes varied as a function of time (e.g., during versus after Ramadan or early versus late during Ramadan). At the between-person level (Level-2) we tested if the Level-1 coefficients varied between participants as a function their participants' gender and religion. Statistical significance was defined as t values > 2 .

Effects of Time Period and Day

First, we tested the effect of time period on emotions and attitudes. We conducted the analyses separately on each outcome variable, and separately on the pre-Ramadan versus Ramadan period (contrast-coded pre-Ramadan = -0.5 , Ramadan = $+0.5$) and the Ramadan versus post-Ramadan period

(contrast-coded Ramadan = -.5, post-Ramadan = +.5). The within-participant level (Level-1) model was:

$$\text{Outcome}_{ij} = \beta_{0j} + \beta_{1j}(\text{Period}_i) + r_{ij}, \quad (1)$$

where Outcome_{ij} is participant j 's outcome (e.g., happiness) level on day i , Period_i is the time period in which day i occurred (e.g., pre-Ramadan versus Ramadan), β_{1j} is the effect of time period on participant j 's happiness, and r_{ij} is residual (within-participant) error. The between-participant level (Level-2) model was:

$$\beta_{0j} = \beta_{00} + u_{0j} \quad (2)$$

$$\beta_{1j} = \beta_{10} + u_{1j}, \quad (3)$$

where β_{00} and β_{10} are the average outcome and average effect of time period across participants, and u_{0j} and u_{1j} are residual (between-participant) error. There were three significant effects of time period: Anger was greater during Ramadan than before Ramadan (unstandardized $b = .154$, $SE = .062$, $t = 2.47$), and fear and sadness were lower during Ramadan than after Ramadan ($bs = .243$ and $.092$, respectively; $SEs = .046$ and $.040$; $ts = 5.28$ and 2.29).

Next, we tested whether outcomes increased or decreased over time within each time period. The Level-1 model was identical to Equation 1, except *Day* replaced *Period*. We analyzed each time period separately, and centered *Day* within time period (thus ranging from -4 to +4 during pre-Ramadan, and from -14.5 to +14.5 during Ramadan and post-Ramadan). For example, to analyze the effect of day on happiness *during Ramadan*, the Level-1 model was

$$\text{Happy}_{ij} = \beta_{0j} + \beta_{1j}(\text{Day}_i) + r_{ij}, \quad (4)$$

where Day_i is the day during Ramadan, β_{0j} is the expected participant j 's expected happiness at the midpoint of Ramadan, and β_{1j} is the estimated change in participant j 's outcome with each passing day. Table ## shows the results. During the pre-Ramadan period, jealousy tended to increase. During Ramadan, happiness and joy tended to increase while impatience, sadness, and moodiness tended to decrease. During the post-Ramadan period, happiness and joy tended to decrease, while fear, impatience, and moodiness tended to increase.

Effects of Religion and Gender

Next, we tested the effects of the level-2 predictors—religion and gender. First, we tested if religion and gender predicted outcomes in general, across all days. To do so, the level-1 model and level-2 equations were:

$$\text{Outcome}_{ij} = \beta_{0j} + r_{ij} \quad (5)$$

$$\beta_{0j} = \beta_{00} + \beta_{01}(\text{Religion}_j) + \beta_{02}(\text{Gender}_j) + u_{0j}, \quad (6)$$

where Religion_j is participant j 's religion (contrast-coded Muslim = -.5; non-Muslim = +.5), Gender_j is participant j 's gender (female = -.5, male = +.5), β_{11} is the effect of being non-Muslim versus Muslim, and β_{12} is the effect of being male versus female. There were no effects of gender, but religion influenced four outcomes: Compared to Muslims, non-Muslims reported being more

moody ($b = .305$, $SE = .107$, $t = 2.84$), less patient ($b = -.296$, $SE = .142$, $t = -2.08$), less happy ($b = -.338$, $SE = .125$, $t = -2.70$), and less joyous ($b = -.306$, $SE = .132$, $t = -2.31$).

Next, we tested if religion and gender moderated the effect of time period by adding time period (pre-Ramadan versus Ramadan, or Ramadan versus post-Ramadan) as a Level-1 predictor as in Equation 1, and adding religion and gender as Level-2 moderators as follows:

$$\beta_{ij} = \beta_{10} + \beta_{11}(\text{Religion}_j) + \beta_{12}(\text{Gender}_j) + u_{ij}, \quad (7)$$

where β_{11} and β_{12} are the effects of religion and gender on the effect of time period on the outcome. Religion moderated differences in fearfulness between pre-Ramadan and Ramadan ($b = -.297$, $SE = .137$, $t = -2.16$), and moderated differences in moodiness between Ramadan and post-Ramadan ($b = .218$, $SE = .079$, $t = 2.75$). Analyzing the effect of time period on Muslims and non-Muslims separately, fearfulness declined slightly from the pre-Ramadan to the Ramadan period among non-Muslims ($b = -.356$, $SE = .172$, $t = -2.1$), but not among Muslims ($b = -.010$, $SE = .057$, $t = -0.17$); and moodiness declined from the Ramadan to the post-Ramadan among Muslims ($b = -.117$, $SE = .043$, $t = -2.76$), but not among non-Muslims ($b = .092$, $SE = .067$, $t = 1.37$). Gender moderated differences in jealousy between Ramadan and post-Ramadan ($b = -.130$, $SE = .053$, $t = -2.43$); repeating the analysis on males and females separately, jealousy declined from the Ramadan to the post-Ramadan period among males ($b = -.093$, $SE = .037$, $t = -2.50$), but not among females ($b = .035$, $SE = .028$, $t = 1.25$).

Finally, we tested if religion and gender moderated the effects of day on outcomes within each period (using the type of Level-1 model shown in Equation 4 and the Level-2 models shown in Equations 6 and 7), but found no significant moderating effects of either religion or gender.

DISCUSSION

Summary of Results

Overall, anger was greater during than before Ramadan, and fear and sadness were lower during than after Ramadan. Thus, participants tended to report less negative affect during the fasting period of Ramadan. Emotional states also varied within each time period: Jealousy increased during the pre-Ramadan period; happiness and joy increased while impatience, sadness, and moodiness decreased during Ramadan; and happiness and joy decreased, while fear, impatience, and moodiness increased following Ramadan. Thus, while affect tended to improve during Ramadan, it tended to decline again after the end of Ramadan.

Independent of time period, non-Muslims reported less positive affect and more moodiness than did Muslims. One potential explanation is that awareness of being a minority may reduce positive affect, and participating in the current study may have made their minority status more salient to the non-Muslim participants. Religious affiliation also predicted changes in emotions across time periods. Specifically, there was a weak tendency for non-Muslims (but not Muslims) to experience less fear during than before Ramadan, and a more robust tendency for Muslims (but not non-Muslims) to experience more moodiness during than after Ramadan.

It is intriguing that religion did not moderate most of the effects of Ramadan on emotions. One explanation is that our sample contained too few non-Muslim participants to detect the effects of religious affiliation. However, another explanation is that the emotional consequences of Ramadan on practicing Muslims indirectly influenced non-Muslim participants through their interactions with Muslims and their living in a country where the majority of citizens identify as Muslim.

The only gender effect was that males (but not females) reported less jealousy following Ramadan than during Ramadan, and even this effect was weak. The lack of gender effects may indicate that gender in fact has little influence on the emotional consequences of Ramadan fasting. On the other hand, given that only 26% of our sample was male, it seems prudent to await the results of future research that includes a larger sample of males before drawing conclusions regarding the presence or absence of gender differences in emotional responses to Ramadan.

Also interesting is the absence of effects of time (both within and between time periods) on calmness, patience, obedience, or stubbornness. Perhaps these states are more reflective of stable dispositions, while the other emotional states (e.g., happiness, fear, anger) are more responsive to current and changing circumstances.

Limitations

Our sample consisted of young Malaysian adults currently attending university; further research is necessary to determine to what extent the current results will generalize to people of other ages, from other countries, or in other circumstances.

REFERENCES

- Adlouni, A., Ghalim, N., Benslimanie, A., Lecerf, J. M., & Saile, R. (1997). Fasting during Ramadhan induces a marked increase in high-density lipoprotein cholesterol and decrease in low-density lipoprotein cholesterol. *Annals of Nutrition and Metabolism*, 41, 242–249.
- Adlouni, A., Ghalim, N., Saile, R., Had, N., Parra, H. J., & Benslimanie, A. (1998). Beneficial effect on serum apo AI, apo B and Lp AI levels of Ramadan fasting. *Clinica Chimica Acta*, 271, 179–189. doi: 10.1016/S0009-8981(97)00245-3
- Ajilola, A. A. (2000). *Ramadan: Fasting (sawm)*. Delhi: Adam Publishers and Distributors.
- Akhoundan, M., Shadman, Z., Poorsoltan, N., Larijani, B., & Khoshniat, M. N. (2015). Ramadan major nutrient patterns are associated with anthropometric measurements and physical activity in Tehran, Iran. *Journal of Fasting and Health*, 3, 21–28.
- Akhyar, A. (2010). *Ajaibnya puasa senjata mengawal nafsu*. Johor: Pustaka Azhar.
- Al-Azazy, S. A. (2010). *Tamammul Minnah: Shahih fiqih sunnah berdasarkan Al-Quran dan sunnah ash-shahihah*. Jakarta: Pustaka As-Sunnah.
- Al-Bukhari. (1987). *Sahih al-Bukhari*. Beirut: Dar Ibn Kathir.
- Al-Bukhari. (2008). *Fathul Baari: Penjelasan kitab Shahih Al-Bukhari (buku 11)* (Ibn Hajar al-Asqalani, Trans.). Jakarta: Pustaka Azzam.
- Al-Ghazali, I. (2009). *Mutiara Ihya' Ulumuddin: Hak milik Muslim, Imam Al-Ghazali* (al-Qasimi ad-Dimasqi, Trans.). Shah Alam: Illusion Network.
- Al-Ghazali, I. (2012). *Minhajul Abidin wasiat Imam al-Ghazali* (Z. Adham, Trans.). Kuala Lumpur: Victory Agencie.
- Al-Hambali, I. R. (2007). *Lathaif al-Ma'arif*. Beirut: Al-Maktab Al-Islami.
- Al-Maliki, A. A., & Al-Nuri, H. S. (2011). *Ibanah al-Abkam Syarah Bulugh al-Maram (N. H. H. M. Fauzi, Trans.)*. Selangor: Al-Hidayah Publication.
- Al-Qardhawy, Y. (1995). *Al-Ibadah fi al-Islam*. Kaherah: Maktabah Wahbah.
- Al-Quran. (2007). *Text and translation by Abdullah Yusuf Ali*. Kuala Lumpur: Islamic Book Trust.

- Al-Quran. (2013). *Tafsir pimpinan ar-Rahman kepada pengertian al-Quran*. Kuala Lumpur: Darul Fikir.
- Amirfakhraei, A., & Alinaghizadeh, A. (2012). The impact of praying and fasting on the mental health of students attending the Bandar Abbas branch of Islamic Azad University in Iran in 2012. *Life Science Journal*, 9, 2179–2184.
- Bahreyni, S., Mazidi, M., Rezaie, P., Vakili, R., Norouzy, A., Hashemy, S., . . . Nematy, M. (2015). The effect of Ramadan fasting on the level of sex hormones in pre-menarche girls in Mashhad, Iran. *Journal of Fasting and Health*, 3, 43–49.
- Bliese, P. (2000). Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In K. J. Klein, & S. W. Kozlowski, (Eds.), *Multilevel theory, research and methods in organizations* (pp. 349–381). San Fransisco, CA: Jossey Bass.
- Budak, A. (2005). *A comprehensive guide: Fasting in Islam and the month of Ramadan*. New Jersey: The light.
- Fedail S, Murphy, D., Salih, Y., Bolton, C., & Harvey, R. (1982). Changes in certain blood constituents during Ramadan. *The American Journal of Clinical Nutrition*, 36, 350–353.
- Hoffman, L. (1996). Progress and problem in the study of adolescence. *Journal of Development Psychology*, 32, 777–780.
- Husain, R., Duncan, M. T., Cheah, S. H., & Ch'ng, S. L. (1987). Effects of fasting in Ramadan on Tropical Asiatic Moslems. *British Journal of Nutrition*, 58, 41–48.
- J.E. Mathieu, Taylor, S.R. (2007). A framework for testing meso-mediational relationships in organizational behaviour. *Journal of Organizational Behaviour*, 28, 141–172.
- James, L. R., Demaree, R. G., & Wolf, G. (1984). Estimating within-group interrater reliability with and without response bias. *Journal of Applied Psychology*, 69, 85–98.
- Khalid, A. M. (2007). *Peribadi penuh arti*. Jakarta: PT Serambi Ilmu Semesta.
- Khoushali, A. N., Hajiamini, Z., Ebadi, A., Bayat, N., & Khamseh, F. (2013). Effect of Ramadan fasting on emotional reactions in nurses. *Iranian Journal of Nursing and Midwifery Research*, 18, 232–236.
- Koch, G. G. (1982). Intraclass correlation coefficient. In *Encyclopedia of statistical sciences*. New Jersey: John Wiley & Sons, Inc.
- Kozlowski, & Hattrup, K. (1992). A disagreement about within-group agreement: Disentangling issues of consistency versus consensus. *Journal of Applied Psychology*, 77, 161–167.
- LeBreton, J. M., & Senter, J. L. (2008). Answers to 20 questions about interrater reliability and interrater agreement. *Organizational Research Methods*, 11, 815–852.
- LeBreton, J. M., Burgees, J. R., Kaiser, R. B., Atchley, E. K., & James, L. R. (2003). The restriction of variance hypothesis and interrater reliability and agreement: Are ratings from multiple sources really dissimilar? *Organizational Research Methods*, 6, 80–128.
- MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effects: Distribution of the product and resampling methods. *Multivariate Behavioral Research*, 39, 99–128.
- Malik, I. (1993). *Terjemahan Muwaththa' al-Imam Malik R.A.* (K. A. Musthofa, Trans.) Kuala Lumpur: Victory Agencie.
- Mathieu, J. E., & Taylor, S. R. (2007). A framework for testing meso-mediational relationships in organizational behavior. *Journal of Organizational Behavior*, 28, 141–172.

- Mathieu, J. E., Aguinis, H., Culpepper, S. A., & Chen, G. (2012). Understanding and estimating the power to detect cross-level interaction effects in multilevel modeling. *Journal of Applied Psychology, 97*, 951–966.
- Mathieu, J. E., Maynard, M. T., Taylor, S. R., Gilson, L. L., & Ruddy, T. M. (2007). An examination of the effects of organizational district and team context on team processes and performance: A meso-mediational model. *Journal of Organizational Behavior, 28*, 891–910.
- Mesbahzadeh, B., Ghiravani, Z., & Mehrjoofard, H. (2005). Effects of Ramadan fasting on secretion of sex hormones in healthy single males. *Eastern Mediterranean Health Journal, 11*, 1120–1123.
- Mousavi, S. A., Rezaei, M., Baghni, S. A., & Seifi, M. (2014). Effect of fasting on mental health in the general population of Kermanshah, Iran. *Journal of Fasting and Health, 2*, 65–70.
- Muslim, I. (2004). *Ringkasan Shahih Muslim* (Z. A.-D.-A. Al-Mundziri, Trans.) Selangor: Crescent News (KL) Sdn. Bhd.
- Nezlek, J. B. (2001). Multilevel random coefficient analyses of event- and interval-contingent data in social and personality research. *Personality and Social Psychology Bulletin, 27*, 771–785.
- Norouzy, A., Salehi, M., Philippou, E., Arabi, H., Shiva, F., Mehrnoosh, S., . . . Nematy, M. (2013). Effect of fasting in Ramadan on body composition and nutritional intake: A prospective study. *Journal of Human Nutrition and Dietetics, 26*, 97–104.
- Peugh, J. L. (2010). A practical guide to multilevel modeling. *Journal of School Psychology, 48*, 85–112.
- Preacher, K. J., & Selig, J. P. (2012). Advantages of Monte Carlo confidence intervals for direct effects. *Journal of Communication Methods and Measures, 6*, 77–98.
- Ramadan, J., Telahoun, G., Al-Zaid, N., & Barac-Nieto, M. (1999). Responses to exercise, fluid and energy balances during Ramadan in sedentary and active males. *Applies Nutritional Investigation, 15*, 735–739.
- Raundenbush, S. W., Bryk, A. A., Cheong, R. T., & du Toit, M. (2011). *HLM 7: Hierarchical linear & nonlinear modeling*. Lincolnwood, IL: Software International Inc.
- Rosita, C. H. (2009). *Puasa dan pengendalian diri perspektif kesehatan mental*. Yogyakarta: Universitas Islam Negeri Sunan Kalijaga.
- Roy, J., Hwa, O. C., Singh, R., Aziz, A. R., & Jin, C. W. (2011). Self-generated coping strategies among Muslim athletes during Ramadan fasting. *Journal of Sports Science and Medicine, 10*, 137–144.
- Saliem, A.-H., & AbdulHamied, A. H. (1988). *Puasa Rasulullah*. Jakarta: Gema Insani Press.
- Salim, A. M. (1997). *Bersama Rasulullah di bulan Ramadhan*. Selangor: Pustaka Ilmi.
- Sazgarnia, A., Montazerabadi, A., Bahreyni-Toosi, M., & Ahmadi, A. (2013). *Photosensitizing and radiosensitizing effects of mitoxantrone: Combined chemo-, photo-, and radiotherapy of DFW human melanoma cells*. Department of Medical Physics, Research Center of Medical Physics, Mashhad University of Medical Sciences, Mashhad, Iran.
- Selig, J. P., & Preacher, K. J. (2008). Monte Carlo method for assesing mediation: An interactive tool for creating confidence intervals for direct effect [Computer software]. Available from <http://quantpsy.org/>.
- Sweileh, N., Schnitzler, A., Hunter, G., & Davis, B. (1992). Body composition and energy metabolism in resting and exercising muslims during Ramadan fast. *The Journal of Sport*

Medicine and Physical Fitness, 32, 156–163.

- Wang , J., Peter , A., David , C., Sherrington , C., & Khoshdel, E. (2013). Synthesis and characterization of micrometer-sized molecularly imprinted spherical polymer particulates prepared via precipitation polymerization. *Pure and Applied Chemistry*, 79, 1505–1519.
- West, S. G., Ryu, E., Kwok, O. M., & Cham, H. (2011). Multilevel modeling: Current and future applications in personality research. *Journal of Personality*, 79, 2-50.
- Yaman, J. (2012). *Bimbingan, penghayatan dan kesempurnaan solat*. Selangor: Nadi Minda Resources.
- Zerguini, Y., Kirkendall, D., Junge, A., & Dvorak, J. (2007). Impact of Ramadan on physical performance in professional soccer players. *British Journal of Sport Medicine*, 41, 398–400.

Table ##

Daily Changes in Emotions and Attitudes during pre-Ramadan, Ramadan, and post-Ramadan Periods

Outcome	pre-Ramadan			Ramadan			post-Ramadan		
	<i>b</i>	<i>SE</i>	<i>t</i>	<i>b</i>	<i>SE</i>	<i>t</i>	<i>b</i>	<i>SE</i>	<i>t</i>
Positive Emotions									
Happy	.007	.019	0.39	.008	.003	2.74*	-.013	.003	-4.19**
Joy	.001	.021	0.06	.010	.003	3.32**	-.015	.003	-4.26**
Patient	.001	.015	0.05	-.001	.003	-0.34	.002	.002	0.98
Calm	-.015	.024	-0.63	.003	.003	1.00	-.003	.003	-0.89
Negative Emotions									
Angry	.017	.019	0.89	-.003	.003	-1.08	.002	.003	0.92
Fearful	.005	.020	0.25	-.004	.002	-1.44	.020	.004	5.46**
Impatient	-.013	.016	-0.78	-.007	.003	-2.93**	.007	.003	2.50*
Jealous	.032	.012	2.66**	.002	.002	0.96	.001	.002	0.35
Moody	.007	.016	0.45	-.007	.003	-2.65*	.008	.003	2.73*
Sad	-.003	.020	-0.15	-.008	.003	-2.78*	.006	.003	1.94
Attitudes									
Obedient	-.002	.020	-0.11	.000	.003	-0.07	.000	.003	0.06
Stubborn	.015	.014	1.04	-.002	.002	-0.72	-.002	.003	-0.71

Note. Values are unstandardized regression coefficients reflecting the change in outcomes (assessed on 1 to 6 scales) as a function of one day increments during each time period.

* $p < .05$. ** $p < .005$.