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# Satisfaction with current martial arts' uniforms and purchase intention of new uniforms

Anna Perry[1*] ⓘ and Juyoung Lee[2]

*Correspondence:
anna.perry@colostate.edu
[1] Colorado State University,
1574 Campus Delivery,
Gifford 313, Fort Collins, CO
80523-1574, USA
Full list of author information
is available at the end of the
article

**Abstract**

The purpose of the present study is to investigate martial arts practitioners' satisfaction with their current uniforms and purchase intention of new uniforms. A total of 588 martial arts practitioners were recruited via Amazon Mechanical Turk, including 401 men and 187 women. The results indicated that martial art practitioners were satisfied with their current uniforms when three functional attributes were good: quality, fit, and comfort. The aesthetic variable, fashion, only moderately influenced satisfaction with the current uniforms. However, when purchasing new uniforms, both functional and aesthetic attributes were essential factors. In addition, benefits of martial arts and protection from injury were two necessary conditions for commitment to martial arts. However, neither commitment to martial arts or satisfaction with the current uniform contributed to purchase intention of new uniforms. The purchase intention was only related to the characteristics of the new uniforms: whether the new uniforms can enhance practitioners' functional performance and aesthetic appearance. The present study, for the first time, revealed marital arts practitioners' strong desire of protection: protection strongly contributed to expected performance, expected appearance, and commitment to martial arts.

**Keywords:** Martial arts uniforms, Satisfaction, Protection, Purchase intention

## Introduction

Martial arts refers to various systems of training for combat, including Karate, Taekwondo, Kung Fu, Judo, Jujitsu, Tai Chi, Aikido, Hapkido, Muay Thai, Mixed Martial Arts, etc. (Rousseau 2015). The martial arts industry has grown tremendously (Ko 2003). The total revenue of the martial arts studio industry in the world was $3 billion in 2014, and the average annual growth rate was 1.2% from 2009 to 2014 (Diment 2014). As the number of people involved in martial arts increases, the demand for martial arts uniforms increases. Although martial arts clothing has been a high growth product, academic research has focused little on it. Previous research conducted on martial arts mostly emphasized how to prevent injury (Kochhar et al. 2005) and few patents therefore focused on developing protective devices (Chi et al. 2004). No study has examined martial arts practitioners' clothing needs, whether, practitioners are satisfied with their current uniforms and what types of uniforms they prefer to purchase are unclear. Therefore,

the purpose of this study is to identify factors that influence martial arts practitioners' satisfaction with their current uniforms and their purchase intention for new uniforms.

This study provides both theoretical and empirical contributions. Theoretically, by testing how factors influence satisfaction with current uniforms and purchase intention of new uniforms, this study provides a theoretical foundation for future studies of sportswear. Practically, this study provides valuable insights to guide apparel companies to create better martial arts uniforms to meet consumers' needs.

## Literature review

### Theoretical framework

The Functional, Expressive, and Aesthetic Consumer Needs Model (FEA Model) has been used to identify functional clothing needs of target consumers (Lamb and Kallal 1992), such as for consumers' hospital gowns (Cho 2006), women's sailing apparel (Bye and Hakala 2005), and adolescent disabled girls' clothing (Stokes and Black 2012). According to the FEA Model, function, expression, and aesthetic are three considerations for apparel (Lamb and Kallal 1992). Functional consideration is related to protection, fit, and comfort; expressive consideration is related to the communicative aspects of clothing; aesthetic consideration is related to the human desire of beauty, such as fashion and style (Lamb and Kallal 1992).

The current study only incorporated functional and aesthetic considerations from the FEA model. The reasons were the following. Both aesthetic and functional aspects are central criteria to evaluate apparel products, including martial arts uniforms (Chattaraman and Rudd 2006; Perry and Chung 2016). However, expressive consideration is not important for all martial arts uniforms. For example, Karate belt colors communicate rank levels, while Tai Chi belt colors do not have any meaning; Judo uniforms communicate cultural meanings, while Mixed Martial Arts uniforms are not related to cultural meanings. Therefore, the expressive consideration was not suitable to assess all martial arts uniforms together in the current study. In addition, empirical studies have indicated that functional performance and aesthetic appearance, rather than expressive consideration, are essential factors for sportswear (Dickson and Pollack 2000). Furthermore, to fit individual study contents, many empirical studies have also excluded expressive considerations (e.g., Jin and Black 2012; Michaelson 2015).

To meet the research purpose, variables were chosen and causal relationships were proposed. First, to assess martial arts practitioners' satisfaction with their current uniforms, functional and aesthetic variables of the current uniforms were chosen based on the FEA model and previous literature (Dickson and Pollack 2000; Lamb and Kallal 1992). In the current study, functional attributes included quality, fit, comfort, and protection; aesthetic attributes included fashion. They were all modified from previous research (e.g., Bye and Hakala 2005; Chen et al. 2010; Dickson and Pollack 2000; Gupta 2011; Wheat and Dickson 1999). Quality refers to durability, construction, and resistance to shrinkage of the martial arts uniforms (Wheat and Dickson 1999). Fit refers to how well a uniform is conformed to the body and the balance between the uniform and the body (Chen et al. 2010). Comfort refers to the wearer's feeling of the uniform (Bye and Hakala 2005). Protection refers to the ability to keep the body safe from potential

harm (Gupta 2011). Fashion refers to the martial arts uniforms latest styles and how good the uniform looks on practitioners (Dickson and Pollack 2000).

Second, to assess practitioners' purchase intention of new uniforms, four variables were chosen as antecedents: satisfaction with current uniforms, expected performance and expected appearance of new uniforms, and commitment to martial arts. Satisfaction with current uniforms, which refers to a practitioner's overall experiences and pleasure with the current uniforms, was chosen based on previous literature (Olsen 2007). Expected performance, which refers to an expectation that the new martial arts uniforms would enhance the practitioner's performance (Wheat and Dickson 1999), and expected appearance, which refers to an expectation that the new uniforms would enhance the practitioner's aesthetic appearance (Dickson and Pollack 2000), were chosen based on the FEA model and previous literature (Dickson and Pollack 2000; Lamb and Kallal 1992). Commitment to martial arts, which refers to the level of priority given to martial arts (Mitchka et al. 2008), was chosen based on previous studies' conclusion that commitment was a significant antecedent of purchase intention (Olsen 2007; Yi and La 2004).

Thirdly, functional (e.g., quality, fit, size, comfort, and protection) and aesthetic variables (e.g., fashion) of the current uniforms were likely to influence the expected performance and the expected appearance of new uniforms (Choi and Ashdown 2002; Dickson and Pollack 2000). Therefore, causal relationships between the current uniforms' attributes and new uniforms' expected performance and appearance were proposed.

Fourth, because commitment is influenced by various benefits, benefits of martial arts (e.g., enjoyment, happiness, and relaxation) and benefits of martial arts uniforms (e.g., protection from injury) were also chosen (Ju et al. 2009).

In sum, drawing from the FEA Model's functional and aesthetic considerations, the current study proposed a modified model, including functional variables, aesthetic variables, and satisfaction with current uniforms; expected performance and appearance of new uniforms; benefits of and commitment to martial art; and intention to purchase new uniforms. Future studies may use the modified model as a theoretical foundation of functional sportswear. More justifications of causal relationships are presented in the following sections.

### Current uniform attributes and satisfaction with current uniforms

The FEA Model suggests both functional attributes and aesthetic attributes influence satisfaction with a garment (Lamb and Kallal 1992). Empirical studies have shown satisfaction was influenced by various apparel attributes across numerous apparel products, for example, quality of apparel products (Kim and Damhorst 2009), function and style of disabled girls' clothing (Stokes 2010), fit and comfort of in-line skaters' clothing (Dickson and Pollack 2000), comfort and attractiveness of styles of female golfers' uniforms (Wheat and Dickson 1999), fit and size of dancewear (Mitchka et al. 2008) and flight attendants' uniforms (Santos et al. 2010), comfort, fit, construction, size, fabric, fiber content, style, fashion, and attractiveness of tennis wear (Chae et al. 2006), and aesthetically pleasant, fit, and safety of bicycle clothing (Steinhardt 2010). Therefore, based on the FEA model and previous research, both functional attributes (e.g., quality, fit,

protection, and comfort) and aesthetic attributes (e.g., fashion) of current uniforms were proposed to influence martial arts practitioners' satisfaction with current uniforms:

*H1a*    Quality positively influences satisfaction with current uniforms.

*H1b*    Fit positively influences satisfaction with current uniforms.

*H1c*    Protection positively influences satisfaction with current uniforms.

*H1d*    Comfort positively influences satisfaction with current uniforms.

*H1e*    Fashion positively influences satisfaction with current uniforms.

### Current uniform attributes and expected performance of new uniforms

Functional sportswear is expected to increase a wearer's performance (Choi and Ashdown 2002; Wheat and Dickson 1999). For example, runners want their clothing to meet expected performance (Leksrisompong 2010); pear workers want clothing to increase mobility and work efficiency (Choi and Ashdown 2002); golfers want to have sufficient back length to achieve an uninhibited swing (Wheat and Dickson 1999); sailors require uniforms which allow quick actions while the body is in a confined space (Bye and Hakala 2005); and soldiers want body armor to not restrict ease of movement (Starr et al. 2015).

Apparel functional attributes influence a wearer's performance (Bye and Hakala 2005; Jin and Black 2012). Quality indicators, such as durability, sewing quality, and shrinkage, may influence a wearer's action. For example, clothing may tear during training when the materials are not durable or the stiches are not strong. Shrinkage leads to a poor fit. Poor fitting clothing further restrains movement (Michaelson 2015). For example, loose thigh or tight crotch of rock climbing pants influenced climbers' movement (Michaelson 2015), garments with excess bulk inhibit sailors' mobility (Bye and Hakala 2005), and tight sleeves restrict tennis players when serving tennis balls (Jin and Black 2012). Similarly, ill-fitting martial arts pants (e.g., too narrow or too big) may restrict high kick actions.

In addition, injury affects martial arts practitioners' performance (Feehan and Waller 1995). Therefore, protecting practitioners from injury is expected to enhance their physical performance. Empirical studies have also shown that rock climbers expect to have better protective pants to improve climbing performance (Michaelson 2015).

Furthermore, comfort is one of the major factors that increase sports players' performance (Çivitci and Dengin 2014; Jin and Black 2012). Clothing comfort is not only related to the physical feel of the materials (e.g., soft or stiff), but also related to thermal balance, breathability, and the permeability of fabric (Bye and Hakala 2005). Breathable and permeable uniforms would help practitioners keep a comfortable temperature; however, the non-breathable and non-permeable uniforms may become sticky in sweaty conditions and therefore impede practitioners' mobility. Empirical studies indicated that comfort influenced soldiers' mobility (Starr et al. 2015) and it was the most important

attribute that affects a runner (Çivitci and Dengin 2014) and male tennis players' performance (Jin and Black 2012).

An important evaluation resource of future products' performance comes from familiar products (Chae et al. 2006). The expected performance of a new future product is updated through consumption experiences of the current product attributes (Yi and La 2004). Therefore, quality, fit, protection, and comfort of the current uniforms were supposed to positively influence expected performance of the future martial arts uniforms:

*H2a*    Quality positively influences expected performance of new uniforms.

*H2b*    Fit positively influences expected performance of new uniforms.

*H2c*    Protection positively influences expected performance of new uniforms.

*H2d*    Comfort positively influences expected performance of new uniforms.

### Current uniform attributes and expected appearance of new uniforms

Functional sportswear is also expected to increase the attractiveness of a wearer's appearance (Dickson and Pollack 2000), especially for females. For example, female in-line skaters expected their clothing to enhance feminine looks (Dickson and Pollack 2000). Female sailors and bicyclists also hoped to have feminine and attractive styles of clothing (Bye and Hakala 2005; Casselman-Dickson and Damhorst 1993; Steinhardt 2010). Teen disabled girls were strongly interested in functional clothing with stylish details (Stokes 2010). Male tennis players also had style and appearance expectations (Jin and Black 2012). Runners, regardless of gender, hoped to have attractive running clothing (Leksrisompong 2010).

Fit is not only a critical element that influences garment performance, but also affects the appearance of the garment (Bye and Hakala 2005). Both too tight and too loose garments influence a wearer's appearance. Martial arts uniforms do not offer special protection, unless practitioners wear additional protective equipment (Macan et al. 2006). The protective equipment, such as a chest protector and mouth guard, also affects a practitioner's appearance. Therefore, fit, protection, and fashion of the current uniforms were proposed to influence expected appearance of new uniforms:

*H3a*    Fit positively influences expected appearance of new uniforms.

*H3b*    Protection positively influences expected appearance of new uniforms.

*H3c*    Fashion positively influences expected appearance of new uniforms.

### Benefits and commitment to martial arts

The positive relationship between benefits and commitment has been reported in various fields. For example, employee benefits influenced organizational commitment (Ju et al. 2009); and learning benefits, social benefits, and hedonic benefits influenced

commitment to online brand (Kuo and Feng 2013). While these studies did not focus on martial arts, the significant relationship between benefits and commitment may be applied to martial arts: benefits of martial arts may play significant roles in commitment to martial arts.

Martial arts practices lead to various types and distribution of injuries (Zetaruk et al. 2005). Protective gear offers benefits to both the wearer and the opponent: the wearers get protection from the opponent's attack and the opponent can execute the action better without worrying about serious injuries he/she may bring to the protected wearer (Zetaruk et al. 2005). With protection benefits from injuries, martial arts practitioners may possibly commit to a longer-term practice. In addition, martial arts also offer hedonic and psychological health benefits, such as enjoyment, relaxation, and happiness by learning breath control and mind–body coordination (Woodward 2009). These hedonic and psychological benefits may also increase commitment to martial arts. Therefore, benefits of martial arts apparel (e.g., protection from injury) and benefits of practicing martial arts (e.g., enjoyment, relaxation, and happiness) were expected to influence practitioners' commitment to martial arts:

*H4*   Protection positively influences commitment to martial arts.

*H5*   Benefits of martial arts positively influences commitment to martial arts.

### Factors influence purchase intention of new uniforms

Satisfaction with a product was assumed to positively influence purchase intention of the product later (Olsen 2007). However, empirical studies have reported contradictory results. Some studies reported that satisfaction with previous purchase apparel leads to repurchase behavior (Curtis et al. 2011; Heitmann et al. 2007). Other researchers reported that satisfaction has little influence on repurchase intention (Olsen 2007; Suh and Yi 2006). In the apparel field, satisfaction with apparel purchases did not necessarily increase repurchase (Voss et al. 2010). To further understand how satisfaction with current uniforms related to purchase intention of new uniforms, a positive relationship between them was temporarily proposed.

Both expected apparel performance and expected appearance positively influenced purchase intention of apparel (Dickson and Pollack 2000). Athletes had similar dual needs for their uniforms: both functionally enhancing performance and aesthetically pleasing appearance (Wheat and Dickson 1999). Casselman-Dickson and Damhorst (1993) found that performance-enhancing factors such as enhancing physical performance and helping to ride faster were key determinants for considering buying/using cycling clothing, and at the same time, modest but attractive appearance was also desired. Dickson and Pollack (2000) reported that enhancement of performance and fashionable appearance significantly predicted in-line skaters' clothing buying intention. Leksrisompong (2010) also found that running clothing's function and aesthetic were two important predictors to purchase.

Commitment plays a significant role in product purchase and repurchase behavior (Olsen 2007). High-commitment customers have more repurchase intentions of a

given product than low-commitment customers (Yi and La 2004). Similarly, people with higher commitment to a sport tend to purchase the specialized sport clothing (Mitchka et al. 2008). For example, the commitment to in-line skating significantly influenced consumers' purchase intention of special skating clothing (Dickson and Pollack 2000).

In sum, purchase intention of new martial arts uniforms was proposed to be influenced by practitioners' satisfaction with current uniforms, the expected performance and expected appearance of new uniforms, and practitioners' commitment to martial arts:

*H6*   Satisfaction with current uniforms positively influences purchase intention of new uniforms.

*H7*   Expected performance positively influences purchase intention of new uniforms.

*H8*   Expected appearance positively influences purchase intention of new uniforms.

*H9*   Commitment to martial arts positively influences purchase intention of new uniforms.

## Methods

### Procedure

An online survey, a recruiting email, and a consent form were submitted to an Institutional Review Board (IRB). Once approval was received, the letter, the consent form, and the survey were created on Qualtrics and then linked to Amazon Mechanical Turk (MTurk).

### Questionnaire

All measures were adapted from previous studies (Appendix A). Each item was measured by a 7-point Likert scale. Some measures' names were modified to fit the current study content. For example, fashion vs. comfort ($\alpha = .74$) (Dickson and Pollack 2000) was divided into two different constructs and renamed as a 3-item factor, fashion and a 2-item factor, comfort, respectively. Benefits of martial arts and commitment to martial arts, fit (e.g., size and fit), and expected appearance were adapted from Cowie (2001), with Cronbach's α values of .71, .79, .91, and .85 respectively (Ho 2010). Quality and satisfaction with current uniforms were modified from Wheat and Dickson (1999) with Cronbach's α values of .85 and .96, respectively. Protection and expected performance were adapted from Holland (2007) with Cronbach's α values of .90 and .96, respectively. Intention to purchase were adapted from Baker and Churchill (1977) with a Cronbach's α of .81. All measures included three items, except intention to purchase (5 items) and comfort (2 items). Previous studies have indicated that a 2-item factor is acceptable (Raubenheimer 2004).

### Participants

Martial arts practitioners were the target population. To find as many participants as possible, practitioners were recruited via MTurk. A 50-cent compensation was provided

for completing the survey. Empirical studies have indicated that Mturk data are as reliable as the traditional methods (Buhrmester et al. 2011; Goodman et al. 2013). Potential participants had to answer two questions before they took the survey: 1) Have you ever practiced martial arts? And 2) which types of martial arts (e.g., Aikido, Judo, Karate, Mixed Martial Arts, Tae Kwon Do, etc.) have your practiced? Only when potential participants answered yes on the first question and chose at least one type of martial arts, they were qualified to participate the current study. Otherwise, they would receive an end-survey message and the survey would automatically close.

## Results

### Demographics

A total of 669 subjects attempted to participate the survey, including 81 disqualified subjects, and 588 qualified martial arts practitioners. Of the 588 practitioners, there were 401 males and 187 females. The ages ranged from 18 to 64 with an average age of 29 years ($SD = 7.19$). More than 46% of the participants practiced Karate. Other martial arts types included Judo (21.4%), Taekwondo (17.2%), Jujitsu (16.8%), Kung Fu (11.2%), and Mixed Martial Arts (10%). Nearly 42% of practitioners practice 1–3 h/week, about 34% practice 4–5 h, 15% practice 6–7 h, and almost 9% train 8 or more hours. Almost 70% of practitioners indicated that they have had at least one injury. More demographics were described in Table 1.

### Measurement model

The fit indices of the measurement model indicated an acceptable fit: $\chi^2_{(341)} = 562.01$, $p < .0001$, $\chi^2/df = 1.65$, CFI = .96, TLI = .96, SRMR = .04, RMSEA = .03 (Table 2) (Bentler and Bonnet 1980; Hair et al. 2010).

The measurement model had a good internal reliability (Table 3). The values of Cronbach's α were all higher than .70 (Hair et al. 2010) and item-total correlations were all over .30 (Nunnally and Bernstein 1994).

The measurement model also had a good convergent validity (Table 3): All factor loadings were greater than .50; composite reliability of all constructs were over .70; and the average variance extracted of all constructs were higher than .50 (Hair et al. 2010). In addition, each construct also had a good discriminant validity (Table 4). The square root of the average variance extracted for each construct was bigger than its correlations with any other construct (Fornell and Larcker 1981).

### Structural model and hypotheses results

The structural model had satisfactory levels of fit indices: $\chi^2_{(355)} = 639.68$, $p < .0001$, $\chi^2/df = 1.8$, CFI = .95, TLI = .95, SRMR = .04, RMSEA = .04 (Table 2; Fig. 1). Thirteen out of 18 hypotheses were supported (Fig. 1). According to Floyd et al. (2012), standard path coefficient values between .05 and .14 indicate weak associations, between .15 and .24 indicate moderate associations, and above .25 indicate strong relationships. Therefore, satisfaction with current uniforms was strongly influenced by quality (H1a: $\beta = .37$, $p < .0001$) and fit (H1b: $\beta = .28$, $p < .0001$), and moderately influenced by comfort (H1d: $\beta = .24$, $p < .0001$) and fashion (H1e: $\beta = .16$, $p = .002$), supporting hypotheses H1a, H1b, H1d, and H1e. The four attributes together explained 52% various in

**Table 1 Martial arts information and demographics**

|  | Injury rate (%) | Frequency (*n*) | Percent (%) |
|---|---|---|---|
| Martial arts' types |  |  |  |
| Karate | 73.1 | 271 | 46.1 |
| Judo | 70.6 | 126 | 21.4 |
| Taekwondo | 57.4 | 101 | 17.2 |
| Jujitsu | 63.5 | 99 | 16.8 |
| Kung Fu | 80.3 | 66 | 11.2 |
| Mixed martial arts | 80 | 59 | 10 |
| Tai Chi | 58 | 43 | 7.3 |
| Aikido | 59.5 | 37 | 6.3 |
| Muay Thai | 75 | 28 | 4.8 |
| Krav Maga | 87 | 23 | 3.9 |
| Hapkido | 61.9 | 21 | 3.6 |
| Other | 41.7 | 24 | 4.1 |
| Practice hours per week |  |  |  |
| 1–3 |  | 246 | 41.8 |
| 4–5 |  | 202 | 34.4 |
| 6–7 |  | 88 | 15 |
| 8 or more |  | 52 | 8.8 |
| Injury times |  |  |  |
| 0 |  | 173 | 29.4 |
| 1 |  | 220 | 37.4 |
| 2 |  | 90 | 15.3 |
| ≥3 |  | 105 | 17.9 |
| Gender |  |  |  |
| Male |  | 401 | 68.2 |
| Female |  | 187 | 31.8 |
| Income |  |  |  |
| ≤25,000 |  | 173 | 30 |
| 25,001–50,000 |  | 205 | 35.6 |
| 50,001–75,000 |  | 124 | 21.5 |
| ≥75,001 |  | 74 | 12.9 |
| Ethnicity |  |  |  |
| White |  | 241 | 41 |
| Native Hawaiian |  | 10 | 1.7 |
| Native Indian |  | 35 | 6 |
| African |  | 52 | 8.8 |
| Asian |  | 209 | 35.5 |
| Latino |  | 28 | 4.8 |
| Other |  | 13 | 2.2 |
| Age |  |  |  |
| 18–25 |  | 81 | 18.7 |
| 25.1–35 |  | 199 | 46 |
| 35.1–45 |  | 79 | 18.2 |
| ≥45.1 |  | 74 | 17.1 |

| Age | Max | Min | Mean | SD |
|---|---|---|---|---|
|  | 64 | 18 | 29.52 | 7.19 |

n = 588. Some participants have practiced multiple martial arts types

**Table 2 Fit indices of the measurement and structural models**

| Fit index | Recommended value | Measurement model | Structural model |
|---|---|---|---|
| $\chi^2/df$ | $\leq 3.00$ | 1.65 | 1.77 |
| CFI | $\geq .95$ | .96 | .95 |
| TLI | $\geq .90$ | .95 | .94 |
| SRMR | $\leq .08$ | .05 | .06 |
| RMSEA | $\leq .06$ | .03 | .04 |

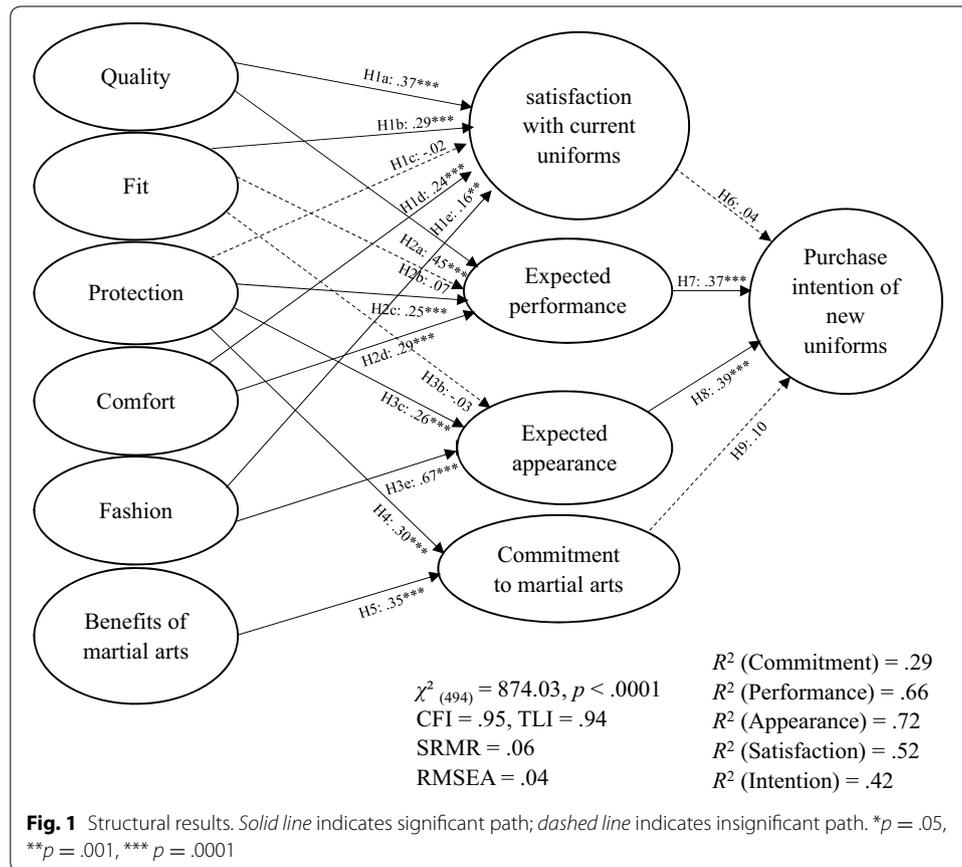**Table 3 Internal reliability and convergent validity of the constructs**

| | Items | Internal reliability | | Convergent and discriminant validity | | |
|---|---|---|---|---|---|---|
| | | Cronbach's α | Item-total correlation | Loading | Composite Reliability | Average variance extracted |
| Quality | Qua_1 | .77 | .62 | .79 | .78 | .54 |
| | Qua_2 | | .64 | .74 | | |
| | Qua_3 | | .57 | .67 | | |
| Fit | Sel_1 | .82 | .68 | .82 | .83 | .73 |
| | Sel_2 | | .76 | .87 | | |
| | Sel_3 | | .59 | .67 | | |
| Protection | Pro_1 | .78 | .65 | .78 | .79 | .56 |
| | Pro_2 | | .69 | .82 | | |
| | Pro_3 | | .51 | .63 | | |
| Comfort | Cof_1 | .71 | .45 | .51 | .73 | .59 |
| | Cof_2 | | .45 | .96 | | |
| Fashion | Fas_1 | .79 | .60 | .68 | .80 | .57 |
| | Fas_2 | | .68 | .83 | | |
| | Fas_3 | | .63 | .75 | | |
| Benefits of martial arts | Enj_1 | .86 | .70 | .78 | .86 | .67 |
| | Enj_2 | | .76 | .84 | | |
| | Enj_3 | | .75 | .84 | | |
| Commitment to marital arts | Com_1 | .76 | .55 | .64 | .77 | .52 |
| | Com_2 | | .65 | .78 | | |
| | Com_3 | | .59 | .74 | | |
| Satisfaction with current uniforms | Sat_1 | .89 | .76 | .82 | .89 | .73 |
| | Sat_2 | | .82 | .89 | | |
| | Sat_3 | | .77 | .85 | | |
| Expected performance | Fun_1 | .83 | .69 | .79 | .83 | .62 |
| | Fun_2 | | .71 | .81 | | |
| | Fun_3 | | .66 | .76 | | |
| Expected appearance | App_1 | .74 | .58 | .73 | .74 | .50 |
| | App_2 | | .58 | .72 | | |
| | App_3 | | .52 | .65 | | |
| Purchase intention of new uniforms | Int_1 | .90 | .73 | .78 | .90 | .65 |
| | Int_2 | | .73 | .78 | | |
| | Int_3 | | .80 | .85 | | |
| | Int_4 | | .79 | .85 | | |
| | Int_5 | | .71 | .76 | | |

**Table 4 Correlations and the square root of AVE**

| | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quality | 5.17 | 1.13 | **.73** | | | | | | | | | | |
| Fit | 5.15 | 1.24 | .57 | **.85** | | | | | | | | | |
| Protection | 4.99 | 1.28 | .44 | .44 | **.75** | | | | | | | | |
| Comfort | 5.02 | 1.31 | .39 | .37 | .25 | **.77** | | | | | | | |
| Fashion | 4.17 | 1.52 | .07 | .13 | .43 | −.12 | **.76** | | | | | | |
| Benefits | 5.50 | 1.18 | .62 | .45 | .35 | .44 | .02 | **.82** | | | | | |
| Commitment | 4.71 | 1.28 | .34 | .31 | .37 | .19 | .41 | .46 | **.72** | | | | |
| Satisfaction | 5.31 | 1.22 | .64 | .60 | .40 | .45 | .17 | .45 | .28 | **.85** | | | |
| Performance | 5.53 | 1.17 | .72 | .26 | .56 | .53 | .01 | .62 | .33 | .48 | **.79** | | |
| Appearance | 4.56 | 1.35 | .14 | .19 | .56 | −.06 | .70 | .15 | .50 | .21 | .13 | **.71** | |
| Intention | 5.00 | 1.28 | .31 | .28 | .46 | .23 | .43 | .38 | .39 | .34 | .49 | .47 | **.81** |

Bold and italic number indicates the square root of AVE

*Benefits* benefits of martial arts, *Commitment* commitment to marital arts, *Satisfaction* satisfaction with the current uniforms, *Performance* expected performance, *Appearance* expected appearance, *Intention* purchase intention of new uniforms



**Fig. 1** Structural results. *Solid line* indicates significant path; *dashed line* indicates insignificant path. *$p = .05$, **$p = .001$, *** $p = .0001$

satisfaction with current uniforms. However, protection (H1c: $\beta = -.02$, $p = .71$) was not related to satisfaction with current uniforms, rejecting hypothesis H1c.

Quality (H2a: $\beta = .45$, $p < .0001$), protection (H2c: $\beta = .25$, $p < .0001$), and comfort (H2d: $\beta = .28$, $p < .0001$) all significantly and strongly influenced expected performance,

supporting hypotheses H2a, H2c, and H2d. The three apparel functional attributes accounted for 66% variance in expected performance. However, fit did not influence expected performance (H2b: $\beta = .07$, $p = .31$), rejecting hypothesis H2b.

Protection (H3b: $\beta = .26$, $p < .0001$) and fashion (H3c: $\beta = .67$, $p < .0001$) strongly and positively influenced expected appearance, supporting hypotheses H3b and H3c. Together, the two attributes accounted for 72% variance in expected appearance. However, fit did not influence expected appearance (H3a: $\beta = -.03$, $p = .56$), rejecting hypothesis H3a.

Benefits from martial arts uniforms, protection (H4: $\beta = .30$, $p < .0001$), and benefits of martial arts (H3b: $\beta = .35$, $p < .0001$), strongly affected commitment to martial arts, supporting hypotheses H4 and H5. Together, the two variables explained the 29% variance in commitment to martial arts uniforms.

Expected performance (H7: $\beta = .37$, $p < .0001$) and expected appearance (H8: $\beta = .39$, $p < .0001$) both strongly influenced purchase intention of new uniform, supporting hypotheses H7 and H8. The two variables accounted for 39% variance in purchase intention. However, satisfaction with current uniform (H6: $\beta = .04$, $p = .52$) and commitment to martial arts (H9: $\beta = .10$, $p = .07$) did not influence purchase intention of new uniform, rejecting hypothesis H6 and H9.

## Discussion

### Apparel attributes and satisfaction

Confirmed with previous studies (Dickson and Pollack 2000; Lamb and Kallal 1992; Mitchka et al. 2008), functional attributes, such as quality ($\beta = .37$, $p < .0001$), fit ($\beta = .28$, $p < .0001$), and comfort ($\beta = .24$, $p < .0001$) and aesthetic attributes, such as fashion ($\beta = .16$, $p = .002$), influenced satisfaction with current martial arts uniforms. Unlike previous studies that fit and comfort were the most important determinants of satisfaction with in-line skaters' clothing, golfers' uniforms, and dancewear, the current study indicated quality was the most important determinant of satisfaction. The reason might be because martial arts are very different sports from skating, golf, and dance. Modern martial arts are combat training that emphasize various offensive and defensive techniques (Woodward 2009). Therefore, durable and well-sewn uniforms are very important: a poor quality uniform may be torn when lapels or sleeves are grabbed.

However, one functional attribute, protection, did not influence stratification of the current uniforms ($\beta = -.02$, $p = .71$). The reason might be because the current martial arts uniforms are made from nonperformance fabric (e.g., cotton canvas) and they do not offer protective features, except when practitioners wear additional protective equipment, such as protective gloves and gum shields (Macan et al. 2006).

### Apparel attributes and expected performance

Confirmed with the previous studies (Bye and Hakala 2005; Wheat and Dickson 1999), apparel functional attributes, quality ($\beta = .45$, $p < .0001$), protection ($\beta = .25$, $p < .0001$), and comfort ($\beta = .28$, $p < .0001$), influenced expected performance. Although protection was not related to satisfaction with current uniforms ($\beta = -.02$, $p = .71$), it was a desired feature that practitioners hoped to enhance their new uniforms' performance ($\beta = .25$, $p < .0001$). The result suggested that a need for safe and protective martial arts practice

has not been fulfilled yet. Martial arts training involves injuries, such as contusion and sprains in Judo and Taekwondo (Pieter 2005). Although protective gear is available in the market, practitioners may wear (e.g., Taekwondo) or may not wear them (e.g., Kung Fu, Judo), depending on the specific martial arts. In addition, the protective gear can reduce risks and injuries but cannot totally stop injuries (Woodward 2009; Zetaruk et al. 2005). In the current study, nearly 70% of participants had at least one injury, including both in unprotected martial arts, such as Judo (70.6%) and Kung Fu (80.3%), and protected martial arts, such as Taekwondo (57.4%) (Table 1).

Interestingly, practitioners satisfied with fit of their current uniforms ($\beta = .28$, $p < .0001$), while practitioners did not think fit can increase expected performance of new uniforms ($\beta = .07$, $p = .31$). Although fit is important in many sportswear, the details of a well-fitting garment differ by sport (Dickson and Pollack 2000). Unlike dancewear (Mitchka et al. 2008), martial arts uniforms are usually not well-conformed to the wearer's body; but instead, the uniforms have a loose shape in order to offer more space for mobility. Therefore, practitioners do not need to have close-fitting uniforms to enhance their performance.

### Apparel attributes and expected appearance

Confirmed with previous studies (Bye and Hakala 2005; Jin and Black 2012), fashion strongly influenced expected appearance of new uniforms ($\beta = .67$, $p < .0001$). In addition, protection strongly influenced expected appearance ($\beta = .26$, $p < .0001$). Therefore, participants not only like a fashionable appearance, but also like to have a protected appearance.

However, again, fit was not related to expected appearance ($\beta = -.03$, $p = .56$). Fit may be a critical element that influences appearance of a garment (Bye and Hakala 2005), but it was not a desired appearance for martial arts practitioners. The standards for appropriate dress for a particular sport are drawn from sport history and tradition (Dickson and Pollack 2000). Traditionally, martial arts uniforms do not display a close-fitting image. Therefore, a close-fitting appearance was not a desired appearance for martial arts practitioners.

### Factors influence commitment to martial arts

The significant relationship between benefits and commitment in other fields was demonstrated in martial arts: benefits from martial arts uniforms, protection ($\beta = .30$, $p < .0001$), and benefits of martial arts ($\beta = .35$, $p < .0001$) strongly affected commitment to martial arts. Consistent with the previous studies (Ju et al. 2009; Kuo and Feng 2013), benefits played important roles in commitment to martial arts. Therefore, practitioners' long term commitment to martial arts was decided by whether they enjoy martial arts and whether they are protected from injury.

### Factors influence purchase intention of new uniform

Expected performance ($\beta = .37$, $p < .0001$) and expected appearance ($\beta = .39$, $p < .0001$) both strongly influenced purchase intention of new uniforms. The results supported previous research that athletes have dual needs for their uniforms: both functionally

enhancing performance and aesthetically increasing physical appearance (Wheat and Dickson 1999).

However, satisfaction with current uniforms ($\beta = .04$, $p = .52$) did not relate to purchase intention of new uniforms. Previous studies reported that the satisfaction with a product before consumption was not related to repurchase intention of the product, because consumers' expectations were changed after using the product (Yi and La 2004). The current study indicated that satisfaction with a product after consumption did not influence purchase intention of the new product either. Practitioners changed their standard when considering buying a new one. For example, they were satisfied with their current uniforms without protection. However, protection was a feature they expected to have in their new uniforms.

In addition, commitment to martial arts did not influence purchase intention ($\beta = .10$, $p = .07$). This result contradicted previous findings that when consumers commit to a sport they are willing to buy special designed clothing for the sport (Dickson and Pollack 2000; Mitchka et al. 2008). There might be an unidentified factor that influences relationship between commitment to a sport and purchase intention of the sportswear. This factor might be trust, which is an important antecedent of commitment (Morgan and Hunt 1994). Trusting martial arts and then committing to martial arts do not mean that practitioners also trusts the new martial arts uniforms. In the current study, practitioners knew their current uniforms did not offer protection and they hoped the new uniforms would offer protection. However, do they really trust the new uniforms can offer enough protection? Previous study also suggested that trust is an antecedent of purchasing (Yoon 2002). Therefore, with an uncertain trust about the new uniforms, commitment to martial arts only had a weak and insignificant association with purchase intention of the new martial arts uniforms.

## Conclusion

Drawing from the FEA model's functional and aesthetic considerations, the current study developed a modified model to investigated martial arts practitioners' satisfaction with current uniforms and purchase intention of new uniforms. The modified model incorporated various factors: functional attributes, aesthetical attributes, and satisfaction with current uniforms; expected performance, expected appearance, and purchase intention of new uniforms; and benefits and commitment of martial arts.

The results indicated that martial art practitioners were satisfied with their current uniforms as long as the three functional attributes were good: quality, fit, and comfort. The aesthetic variable, fashion, only moderately influenced satisfaction with current uniforms. However, to buy new uniforms, both functional and aesthetic attributes were strong and necessary conditions.

In addition, benefits of martial arts and being free from injury are two necessary conditions for commitment to martial arts. However, commitment to martial arts did not influence purchase intention of new uniforms. Satisfaction with current uniforms was also not related to purchase intention of new uniforms, further supporting that practitioners have different standards related to satisfaction with their own uniforms and purchase intention of new uniforms. Purchase intention only related to the new uniforms:

whether the new uniforms can enhance practitioners' functional performance and aesthetic appearance.

### Implications

The current study provided both theoretical and practical implications. This study was the first study to investigate martial arts uniforms from the consumers' perspective. It filled a research gap about consumers' satisfaction with their current martial arts uniforms and purchase intention of new uniforms. In addition, by developing and validating the modified model, this study provided a theoretical foundation for future studies of sportswear.

This study also provided practical insights to guide apparel companies. This study, for the first time, revealed martial arts practitioners' strong desire for protection. Product developers should develop better protective gear which can offer better protection and reduce the high risk for the martial arts that require protective gear (e.g., Taekwondo). Marketing managers may also consider creating protective gear for the martial arts that usually do not require protective gear (e.g., Kung Fu and Judo). In addition, purchase intention was only related to the new uniforms' functional and aesthetics aspects. Therefore, firms should develop new uniforms that can enhance practitioners' performance and appearance.

### Limitations and future studies

The current study had several limitations. First, the current study investigated all martial arts uniforms together. However, the practitioners' uniform needs in Mixed Martial Arts may be different from Judo, for example. Future studies may examine a specific uniform. Furthermore, the current study indicated martial arts practitioners wanted to be protected. Future studies may examine protective equipment from consumers' perspective. In addition, to further understand practitioners' needs and concerns with martial arts uniforms, an in-depth interview study should be conducted.

**Author details**
[1] Colorado State University, 1574 Campus Delivery, Gifford 313, Fort Collins, CO 80523-1574, USA. [2] Mississippi State University, 258 Lloyd-Ricks-Watson Bldg., Mississippi State, MS 39762, USA.

## Appendix A. Measures and items

*Quality:*

My martial arts uniforms are durable.

My martial arts uniforms are sewn well.

My martial arts uniforms resist shrinking during laundering.

*Fit:*

I am able to find martial arts uniforms in my size.

I am able to find martial arts uniforms that fit me very well.

I am able to find martial arts uniforms in the fabrics I prefer.

*Protection:*

An important aspect of martial arts uniforms is that it protects me from injury.

Martial arts uniforms should offer protection from the practice.

I feel I am a better martial arts practitioner when I wear my uniform.

*Comfort:*

I don't care how my martial arts uniforms looks as long as they are comfortable.

Comfort in martial arts uniforms is more important to me than fashion.

*Fashion:*

It is important that my martial arts uniforms are more fashionable than that they keep my body a comfortable temperature.

I try to wear the latest styles of martial arts uniforms.

In general, the way I look in my martial arts uniforms is important to me.

*Benefits of martial arts:*

I enjoy attending martial arts classes.

Martial arts help people relax.

Martial arts increase happiness.

*Commitment to martial arts:*

Missing a martial arts class upsets me greatly.

I practice martial arts even when I am very busy.

I give martial arts higher priority than other activities.

*Satisfaction with current uniform:*

In general, how satisfied are you with your martial arts uniforms?

I am satisfied with my martial arts uniforms.

I like my martial arts uniforms.

*Expected performance:*

I hope to wear martial arts uniforms that will help me practice better.

I hope to wear martial arts uniforms that will allow me to move freely.

I hope to wear martial arts uniforms that will enhance my performance.

*Expected appearance:*

I care about what I wear for practicing martial arts more than others do.

I hope to wear martial arts uniforms that enhance my physical appearance.

I hope to wear unique martial arts uniforms even though I may attract attention.

*Purchase intention of new uniforms:*

I would buy specially designed martial arts uniforms for practicing if it were available.

I intend to buy specially designed martial arts uniforms for practicing later.

I am willing to buy specially designed martial arts uniforms in the future.

I would buy specially designed martial arts uniforms if I wanted to buy a new uniform.

I would be satisfied by specially designed martial arts uniforms rather than normal ones.

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