自主感、勝任感、及關係感對線上外語學習者知覺學習風格偏好的影響

陳柏軒＊

摘要

　　自主感、勝任感、關係感、及知覺學習風格偏好似為影響線上外語學習者成功的重要因素。然而自主感、勝任感、及關係感對知覺學習風格偏好之關係在文獻上仍然不清楚。本研究探討在從事線上外語學習時，外語學習者的自主感、勝任感、及關係感與其知覺學習風格偏好之關係。有 498 位（男 182 位，女 316 位）選修線上英語的大學生有效地填完量表。t 檢定結果顯示：高自主感、勝任感的外語學習者比低自主感、勝任感的外語學習者使用較多的視覺、聽覺、觸覺、動覺、個人、及團體學習風格。而除個人學習風格外，高關係感的外語學習者也比低關係感的外語學習者使用較多的視覺、聽覺、觸覺、動覺、及團體學習風格。因此，線上外語教師應先使外語學習者的自主感、勝任感、及關係感能獲得滿足，以期盼他們能使用更多元的知覺學習風格來增進其線上外語的學習效果。

關鍵字：線上外語學習者，自主感，勝任感，關係感，知覺學習風格偏好

美國華盛頓州立大學博士

通訊 pausany@gmail.com

The Relations of Autonomy, Competence, and Relatedness to Perceptual Learning Style Preferences of EFL Online Learners

Po-Hsuan Chen

Abstract

Autonomy, competence, relatedness, and perceptual learning style preferences appear as main factors that influence EFL online learners' learning outcomes. However, the relations of autonomy, competence, and relatedness to perceptual learning style preferences remain unclear in the online learning literature. The present study was intended to explore the relations of autonomy, competence, and relatedness to learners' perceptual learning style preferences while attending online English classes. A total of 498 (182 males, 316 females) EFL university students completed all the survey items. The t-test revealed that both high-autonomy and high-competence learners used more sensory (visual, auditory, tactile, and kinesthetic) learning styles and sociological (individual and group) learning style compared with low-autonomy and low-competence learners, respectively. Regarding relatedness, high-relatedness learners tended to employ more visual, auditory, tactile, kinesthetic, and group learning styles compared with low-relatedness learners, except individual style. Hence, web EFL teachers should enhance learners' need satisfaction (*autonomy, competence, and relatedness*) in order to broaden their learning style repertoire, which in turn can bring about better learning outcomes.

Introduction

　　Many universities and colleges in Taiwan have offered online English courses to keep up with students' needs, interests and demands. However, an online English course is not a panacea for solving each student's language learning problems because these courses often create their own set of challenges. For example, Jaggars, Edgecombe, and Stacey (2013) conducted a study in the USA inviting about 24,000 students from southern states and 51,000 students from western states as sample to investigate the online English outcomes. They found that in online developmental English, failure and withdraw rates were significantly higher (47%) than those for face-to-face developmental English (23%). Given the high student failure rate in online English courses (Jaggars, Edgecombe, & Stacey, 2013), researchers have called for exploring online learners' motivational and learning style issues. Regarding motivation, one theoretical framework useful for investigating online learners' motivation and learning outcome is self-determination theory (SDT; Chen, Jang, & Branch, 2010; Deci & Ryan, 2002). SDT is based on the assumption that all humans share the psychological needs of *autonomy, competence*, and *relatedness* to develop a sense of self. We are driven by a natural inclination to pursue the fulfilment of those needs and our motivation, performance and development will be greatest when we are able to satisfy them (Alm-Lequeux, 2004). Recently, several researchers have applied SDT in online learning environment. For example, Xie, Durrington, and Yen (2011) found that students' perceived autonomy, competence, and relatedness had different levels of impact on their online discussion behavior. As for learning style, research has indicated that students' performance when faced with technology is very much tied to their particular learning style preferences (Gee, 1990, as cited in Lamboy, 2003). Previous studies also indicated that learners with individual learning style preference can benefit from online language learning environment because online learning context can offer a private environment for self-conscious language learners (Brett, 1996).While the relations of learners' need satisfaction (*autonomy, competence*, and *relatedness*) and learning style to online learners' performance seem to have been identified in the literature, little attention has been given to understanding the association between need satisfaction and perceptual learning style preferences in EFL online learning context. The present study was to examine the effects of autonomy, competence,

and relatedness on perceptual learning style preferences of EFL online learners studying in an evening university program in Taiwan.

Literature Review
Need Satisfaction and Online Learning

One theoretical framework useful for investigating online learners' motivation and learning outcome is self-determination theory (SDT; Chen, Jang, & Branch, 2010; Deci & Ryan, 2002). SDT proposes that for self-determination and optimal psychological functioning to occur, social contexts must fulfill the needs for autonomy, competence, and relatedness (Ryan & Deci, 2000a, 2000b, 2002; Standage, Duda, & Ntoumanis, 2006). SDT proposes that satisfaction of these basic psychological needs is critical for learners' motivation. That is, experiencing perceptions of autonomy, competence, and relatedness is hypothesized to facilitate motivation, as people are likely to return freely to the activities that satisfy their psychological needs (Ma, 2013).

Autonomy

Autonomy is related to self-initiation and self-regulation of one's actions (Deci & Ryan, 1991). In online learning environments, learners have flexibility in terms of time and space, which presents new demands such as learner independence, learner autonomy, and motivation. We assumed that online learners would have many opportunities to fulfill their autonomy needs, which in turn might foster their online learner satisfaction. Some studies support this assumption. For example, Drennan, Kennedy, and Pisarki (2005) examined the association between students' locus of control and online course satisfaction, and found that students with higher levels of control over their learning enjoyed higher levels of course satisfaction compared to their low-control counterparts. Xie, Debacker, and Ferguson (2006) also supported the link between autonomy and online learning. They investigated online discussions and found that instructor control negatively influenced students' motivation. Students' motivation decreased when their participation in online discussions was mandatory. Thus, the positive association found in traditional classrooms between autonomy and learning (Lin, 2010; Zimmer-Grembeck, Chipuer, Hanisch, Creed, & McGregor, 2006) can be generalized to online learning contexts.

Competence

Competence can be defined as the need to be effective in interactions with the environment, which reflects the desire to exercise one's capabilities and skills and, in so doing, seek out and master optimal challenges (Deci & Ryan, 1985). An important feature of online learning is that it demands a variety of skills, such as computer efficacy, computer-mediated communication (CMC) efficacy, and self-regulated learning strategies. Many frustrations of online learners are ability-related, among which technical issues and information overload are most frequently reported (Chen et al., 2010). Several studies have indicated that technical issues are the main reason students dropped their online courses (Tait, 2003). Online learning technologies can be challenging for novice students (Howland & Moore, 2002), and when students feel incompetent using these technologies, or when they encounter technical problems without timely help, they feel anxious, awkward, and distressed (Motteram & Forrester, 2005; Xie et al., 2006). On the other hand, when students feel competent in their ability to participate in online learning, they report more positive attitudes about the online course (Xie, Durrington, & Yen, 2011). Additionally, online learners' perceived ability is a strong predictor of motivation and learning outcomes (Thompson, Meriac, & Cope, 2002). Thus, like in traditional classrooms (Lin, 2010; Zimmer-Gembeck et al., 2006), the satisfaction of students' competence need is also relevant to online learning.

Relatedness

Relatedness involves developing secure and satisfying connections with others in one's social surroundings (Deci & Ryan, 1991). The online learning environment is a relatively isolated context when compared with traditional classrooms, and online learners are often labeled as independent and autonomous learners. However, online learners still have relatedness needs. The concept of relatedness is similar to the concept of a learning community, namely a group of students who have a sense of belonging, possess shared expectations, and are committed to shared educational goals (Rovai, 2002). To fulfill the need for relatedness, students must constantly interact with their teachers and classmates through instant messenger, chat rooms, or e-mails. Several studies have reported that online learners' affiliation is a critical factor influencing their learning success (Dennen, Darabi, & Smith, 2007; Wegerif, 1998) because social

interaction and student affiliation significantly influenced student motivation and learning outcomes (Gao & Lehman, 2003; Marks, Sibley, & Arbaugh, 2005). In a study, Carr (2000) found that when the instructor switched to a more interactive online system and started to efficiently manage online learners' correspondence, online learners' course-completion rates increased from 62 percent to 90 percent. Similarly, Gao and Lehman (2003) reported that students receiving elaborated immediate feedback achieved better than those receiving less interactive feedback. Likewise, Marks et al. (2005) pointed out that instructor-student interactions and student-student interactions stood out as the most significant predictors of perceived learning. Thus, social interactions and feelings of relatedness are essential to online learners' motivation and learning outcomes.

Perceptual Learning Style Preferences and Online Learning

Learning style is broadly defined as "cognitive, affective, and physiological traits that are relatively stable indicators of how learners perceive, interact with and respond to learning environment" (Keefe, 1979, P.4, as cited in Shen, 2010). More specifically, perceptual learning style has to do with the physical environment in which we learn, and involves using our senses in order to perceive data (Reid, 1995). Reid concentrated on perceptual (visual, auditory, tactile, and kinesthetic) and sociological (individual and group) learning style preferences. Visual learners prefer learning through the eyes, and learn best when materials are presented in books or other visual materials, while auditory learners prefer learning through the ears, and learn best when they hear words spoken and from oral explanation. Tactile learners prefer learning through touch, and learn best when given the opportunity to engage in "hands-on" learning, whereas kinesthetic learners prefer learning through physical involvement and learn best through active participation experience. Individual learners prefer learning alone, and learn best independently, while group learners prefer learning with others, and learn best when they are in groups. Cohen and Dörnyei (2002, as cited in Wu, 2010) pointed out that having more different learning styles makes a learner better equipped to meet the requirements of learning tasks of different natures.

As for learning style and language learning, in traditional classrooms, perceptual learning style preferences have been reported to be related to learners' language learning attitudes and beliefs (Cheng & Banya, 1998), strategy use (Cheng & Banya, 1998), motivation (Tai, 2013), lexical inference ability (Shen, 2010), personality

(Cheng & Banya, 1998), and language proficiency (Chen, 2005). Most importantly, the studies pointed out that high language achievers prefer to learn from their eyes and ears (Sy, 2003), and like to study alone (Collinson, 2000). On the other hand, low language achievers learn more easily from tactual/kinesthetic and visual/nonverbal approaches (Kinsella, 1995). With respect to online language learning context, learning medium might lead to different learning preferences (Cohen, 2001). For example, Murray (2004) explored the relation of technology to the learning styles of the students in the ESL/EFL contexts. He found that the kinesthetic learning style preference was strongly preferred by Brazilian online English learners and the web-based virtual formats may have benefited the learners through incorporating virtual kinesthetic cues. In another study, Brett (1996) pointed out that online language learning context could offer a private environment for self-conscious individual learners and the computer offered a forum where learners could lose their self-consciousness. On the other hand, online language learning context might also benefit group learners. In an isolated online learning context, most learners experience anxiety, boredom, and apathy while engaging in online learning activities (Konradt, Filip, & Hoffmann, 2003). Under this condition, classmates' and teachers' support and encouragement might help learners overcome this problem because individuals can be influenced by people related to them when participating in activities that are uninteresting (Deci & Ryan, 2000). Moreover, the cooperative methods used by group learners led to higher achievement than competitive or individualistic ones when measured by a variety of possible indices (Johnson, Johnson, & Holubec, 1990). Employing the Learning Style Model by Kolb, Hu et al. (2005) found that assimilators might benefit more from online English learning than accommodators, whereas online learning effectiveness and outcomes seem comparable between convergers and divergers. The studies reviewed above seem to indicate that learning styles are associated with language learning in online environment.

Need Satisfaction and Perceptual Learning Style Preferences

The impact of need satisfaction on perceptual learning style preferences has not been thoroughly studied yet, and relatively few relevant studies can be found in the literature. As for autonomy and learning style, Ng, and Confessore (2010) did a study among both degree and higher diploma students enrolled in blended distance learning programs in Malaysia. Correlation analysis of each of the learning styles and autonomy extent revealed the positive and moderate correlation between learner

autonomy and all of learning styles, except avoidance. The findings also revealed a positive and moderate relationship between the number of learning styles and level of learner autonomy. In another study conducted by Foroutan, Nooreen, Gani, and Baki (2013), the relation between the learners' autonomy and their learning styles was examined. The results indicated that autonomy was positively related to auditory style, kinesthetic style, visual style, and tactile style, but not related to individual and group learning styles. Likewise, Mojgan and Nematipour (2012) investigated learner's autonomy level and its relationship with learning style in a sample of 200 undergraduate students studying at the Department of Foreign Languages. The results revealed that visual and auditory learning styles were significantly and positively related to their learner autonomy.

Regarding competence and perceptual learning style preferences, Arifin (2014) found that there were some differences in using learning styles by the students of high, middle and low levels of competence. The results of interview showed that almost all students of high level competence used individual learning style, while the middle and low level competence students liked group learning style most because they liked to look for help from other classmates in order to complete tasks and share ideas about the development of some activities. In another study, Verhoeven, Heerwegh, and De Wit (2012) recruited 714 freshmen at a large Belgian university as their sample to investigate how learning styles (or patterns) contributed to the explanation of the variance in self-perceived Information and Communication Technologies (ICTs) skills. The analyses showed that there was a link between learning styles and self-perceived ICT skills, suggesting that having a certain learning style might influence students' perception of their ICT skills.

Concerning relatedness and perceptual learning style preferences, Smith (2008) conducted a study investigating if differences existed in sense of classroom community for computer-mediated instruction (CMI) students in terms of learning style (defined as a preference for independent/individualistic or social/cooperative learning). The results indicated that there was a highly significant difference in sense of social community (the student's feelings of general social connectedness to instructors and peers) among learning style groups. High primary preference for social/cooperative learning (HSLI) group perceived a significantly higher level of social community in their CMI courses than did their peers who

displayed a high primary preference for independent learning (HILS). In another study, Klein and Schnackenberg (2000) investigated the effect of informal cooperative learning and the affiliation motive on achievement, attitude, and student interactions. Results revealed that high affiliation participants expressed significantly more continuing motivation than low affiliation participants for working with another person. On the other hand, low affiliation participants expressed significantly more continuing motivation than high affiliation participants for working alone. Results also indicated that high affiliation dyads exhibited significantly more on-task group behaviors (taking turns, sharing materials, group discussion of content) than low affiliation dyads.

All the studies mentioned above seem to support the potential effects of autonomy, competence, and relatedness need satisfaction on learning styles. To further explore the association between need satisfaction and learning styles, it is helpful to review other relevant studies examining the association between motivation and learning style because the SDT psychological needs (autonomy, competence, and relatedness) satisfaction enhances students' intrinsic motivation. (Gagné & Deci, 2005). To illustrate, Wu's (2010) study was reviewed. Wu conducted a study examining the relationships between language-learning styles (visual, auditory, tactile, kinesthetic, individual, and group) and language-learning motivation of ESL learners studying at a vocational institute in Hong Kong. The results indicated that more motivated learners (regardless of types) were found to exhibit a greater variety of perceptual learning style use compared to less motivated ones. The results also revealed that learners with an integrative orientation (intrinsic motivation) tended to exhibit a wider variety of style preferences, while learners with an instrumental orientation (extrinsic motivation) were found to employ a more limited number of style preferences. If intrinsic motivation will be facilitated by conditions that lead to psychological need satisfaction (Deci & Ryan 2000, as cited in Betoret & Artiga, 2011), and intrinsic motivation is related to perceptual learning style preferences, positive connections can be inferred between psychological needs satisfaction and perceptual learning style preferences. To the researcher's knowledge, no attempts to relate student need satisfaction with perceptual learning style preferences in the EFL online learning context have been made. The present study was addressed to

explore how EFL online learners' psychological needs satisfaction influence their perceptual learning style preferences.

Research Questions

This study attempted to answer three research questions:

1. Are there any differences on perceptual learning style preferences between low-autonomy EFL online learners and high-autonomy EFL online learners?

2. Are there any differences on perceptual learning style preferences between low-competence EFL online learners and high-competence EFL online learners?

3. Are there any differences on perceptual learning style preferences between low-relatedness EFL online learners and high-relatedness EFL online learners?

Method

Research Setting

Online learning environment.

The present study was conducted in the spring semester of 2013 at one of the universities in Taiwan. To provide a flexible and convenient course schedule for the adult learners to access and to suit their needs for continuing education, most of the general education courses offered in the evening program and weekend program at the University were taught via web. A total of 86 courses were offered online at the University during the period of the present study. The courses included English, Chinese, Introduction to Computer, Military Education, History, Arts, and so forth. To help undergraduate freshmen familiarize themselves with online learning management system and user-interface, the Online Learning Center at the University offered a two-hour online learning orientation course during the first week of the spring semester of 2013. They also provided an online learning handbook online for the novice online learners to access. According to the online learning regulations of the University, learners expecting to gain the online learning course credits via web were required to log in to the course regularly, submit their homework on time, join the discussion form, interact with the teacher twice a semester through instant messenger or chat room, attend the face-to-face classroom activities three times, and take the midterm and final examinations. The online learning system used in the present study was called eIDEA 3.5, which was installed at Online Learning Center of

the University. eIDEA 3.5 integrated CMC, and World Wide Web (WWW). These technologies have brought text, graphics, sound, and video to be accessed on a personal computer, enabling English online learners to navigate the materials and communicate with their classmates and instructors through the Internet at their own pace. The online learning environment at the University contained several tools for the learners and the teachers to use: (1) web pages for the presentation of the course description and learning materials, (2) a link area for the teachers and learners to provide links to additional sources of information, (3) a share file space, for the learners and the teacher to share and download files, (4) a journal area for the learners to write semi-privately about their experiences and thoughts (e.g., personal web pages), (5) a record tracking for learners to inspect their learning record including total learning time and learning process, (6) a discussion forum for teachers to post questions and learners to post responses, (7) an e-mail list for the cases in which it was necessary to send announcements to the learners' own e-mail addresses, (8) a bulletin board on which the teacher could post important announcements, (9) a homework area, where the learners could submit their homework to the teachers and read their teacher's feedback to their assignments, and (10) a chat room or instant messenger for teachers and learners to conduct a synchronous (real time) discussion.

Description of the online general English course.

Offered by the Online Learning Center of the University, the online General English was designed for low-intermediate EFL students with an aim to develop their school survival vocabulary and language skills, including listening, reading, and speaking through interesting topics and variety of activities offered by the text books. Topics covered were related to students' daily lives, including music, jobs, the weather, personality, vacation, physical appearance, health, buying gifts, and invitations. All EFL online learning materials were presented in lecture or text format which demanded students' English listening and reading abilities. Students were required to listen to the instructor's oral presentation and read the text prepared by the instructor in the screen. As for vocabulary building, all key words were portrayed in pictures so that students could understand them immediately without explanation or translation. The new words were recycled throughout the lesson to promote student mastery. As for teaching language abilities, the instructor began with asking the students to look at the picture while listening to

the recording. Then students were asked to identify the objects mentioned on the tape, tell who was talking, or tell who was talked about. Next, the students were encouraged to read lists of words. As the lesson progressed, students moved on to reading short dialogues or passages. Listening activities were also followed by guided oral practice with the target language. Students were asked to repeat lines of a dialogue and rehearse the dialogues by themselves in front of the computer. Besides, students were also encouraged to practice this dialogue with a partner after class. The instructor also highlighted the grammar in each lesson, especially focusing on wh-questions, yes/no questions, adjectives, and verbal tenses. Assignments were focused on reading comprehension. Students were asked to read a short passage and answer the multiple-choice questions posted by the instructor. Midterm and final examinations were conducted in written form.

Participants

A total of 498 (182 males, 316 females) EFL university students studying in an evening program at one of the universities in southern Taiwan satisfactorily completed all the survey items. The participants were from a variety of majors and were required to take online English courses to fulfill their program requirements.

Instruments

Two instruments were used in this study: Need Satisfaction Scale (NSS, Standage et al., 2005) and Perceptual Learning Styles Preference Questionnaire (PLSPQ, Reid, 1987).

The NSS (Standage et al., 2005) with 16 items consists of a 7-point Likert-type scale ranging from "*strongly disagree*" (1 point) to "*strongly agree*" (7 points). Originally, the items were designed to assess students' autonomy need satisfaction (items 1, 2, 3, 4, 5, and 6), competence need satisfaction (items 7, 8, 9, 10, and 11), and relatedness need satisfaction (items 12, 13, 14, 15, and 16) in the context of a physical education class. For this study, a 5-point Likert-type scale was used instead of a 7-point scale. Additionally, the stem was modified to suit the EFL online learning context. For example, in the need for autonomy subscale, students responded to the items (e.g., "I have some choice in what I want to do"), preceded by the stem "In this online English learning class." An example item from the need for competence subscale was "I think I am pretty good at learning English via the Internet." The stem for the need for relatedness subscale was "With the other students in this online English learning class I feel..." The stem

was followed by five items such as supported, understood, listened to, valued, and safe. The total score for the autonomy need subscale ranged from 6 to 30, and for the competence and relatedness need subscales ranged from 5 to 25, with high scores indicating high levels of autonomy, competence, or relatedness need satisfaction. The Cronbach's alpha coefficients have been found to be .80 for the autonomy subscale, .87 for the competence subscale, .87 for the relatedness subscale, and .88 for the entire measure (Standage et al., 2005).

PLSPQ (Reid, 1987) was designed particularly for learners of foreign language. The questionnaire with 30 items uses a 5-point Likert-type scale ranging from "*strongly disagree*" (1 point) to *"strongly agree*" (5 points). PLSPQ assesses preferred learning styles of the students based on how students learn best using their perceptions: visual (items   6, 12, 29, 10, and 24), auditory (items 20, 9, 7, 17, and 1), tactile (items16, 14, 25, 11, and 22), and   kinesthetic (items15, 8, 2, 26, and 19) preferences, and two social aspects of learning: individual (items 27, 28, 13, 18, and 30), and group (items 5, 21, 3, 23, and 4) preferences. The total score for each subscale ranged from 5 to25, with high scores indicating high levels of specific learning style preference. The internal consistency reliability coefficients, based on Cronbach's alpha, were.88 for visual, .74 for auditory, .62 for kinesthetic, .86 for tactile, .83 for individual, .74 for group, and .69 for entire measure (Jhaish, 2010).

Procedures

All the instruments were translated into Chinese using a back-translation method, which is regarded as the preferred method of obtaining a culturally equivalent instrument (Berberoglu & Sireci, 1996), to determine the accuracy and comprehensibility of the translation. Before the scales were administered to the participants, a check of the comprehensibility of the first translated version of the two instruments was made. Two experienced English teachers were invited to complete the two instruments and to translate them back to English. They also were invited to judge the comprehensibility and ambiguity of the translation and to suggest changes to improve the items where needed.

A 46-item survey questionnaire that included the NSS and PLSPQ was administered in ten different classes by four different teachers during the 16th week of spring semester 2013, the third time that teachers and EFL online learning students met face to face. To assure that the procedures of administration

for the ten classes of students were standardized and identical, we explained the standardized procedures in detail to the four teachers. The survey questionnaire took approximately 20 minutes to complete. Students' participation was voluntary, and students were informed that their responses would not influence their final grades and that confidentiality was assured.

Data Analysis

The data were computed by using the *SPSS* (Statistical Package for the Social Science) 18.0 software for *Windows*. Factor analysis, reliability analysis, and t-test were employed to analyze the data.

Results and Discussion

Pilot Study for Scale Validation

To validate the Chinese versions of NSS and PLSPQ, a pilot study inviting199 university students (73 males, 126 females) taking online English was conducted. Construct validity has traditionally been defined as the experimental demonstration that a test is measuring the construct it claims to be measuring (Brown, 2000). In the present study exploratory factor analysis was implemented to determine construct validity. To clarify the structure of NSS, the principle component analysis was utilized as the extraction method, with the rotation method of Equamax and Kasier normalization. An item would be retained if the factor loading of the item was larger than.4 in the relevant scale. The KMO measure of sampling adequacy was .89 and Bartlett's Test of Sphericity was significant, χ^2 (120) = 1643.12, *p* < .001, indicating that the NSS data were appropriate for factor analysis. Three factors (competence, autonomy, and relatedness) accounting for 61.31% of the variance were extracted. The resulting factor structure supports the three-factor structure of the need satisfaction theory proposed by Deci and Ryan (2000). The factor loadings for retained items are presented in Table 1. No items were eliminated from the initial 16 items, and there were respectively 5, 6, 5 items in the three scales of NSS. The reliability (alpha) coefficients for the three subscales respectively were .86, .85, and .82, and the overall alpha was .90, suggesting that the scales were reliable for assessing students' need satisfaction.

Similarly, principal component analysis was adopted to clarify the structure of PLSPQ. The KMO measure of sampling adequacy was .84 and Bartlett's Test of Sphericity was significant, χ^2 (435) = 3454.01, *p* < .001, indicating that the

PLSPQ data were appropriate for factor analysis. Six factors (visual, group, individual, tactile, kinesthetic, and auditory preferences) accounting for 65.52%% of the variance were extracted. The resulting factor structure is identical to the factor structure proposed by Reid (1995). The factor loadings for retained items are presented in Table 2. No items were eliminated from the initial 30 items, and there were respectively 5 items in each scale of PLSPQ. The reliability (alpha) coefficients for the six subscales respectively were .91, .88, .86, .83, .80, and.75, and the overall alpha was .88, suggesting that the scales were reliable for assessing students' learning style.

Table 1
Factor Loadings and Reliability for NSS Three-Factor Solution

Item	Factor 1	Factor 2	Factor 3
Factor 1: Competence, α = .86			
Item 7	.62		
Item 8	.79		
Item 9	.76		
Item 10	.83		
Item 11	.61		
Factor 2: Autonomy, α = .85			
Item 1		.64	
Item 2		.54	
Item 3		.56	
Item 4		.74	
Item 5		.79	
Item 6		.75	
Factor 3: Relatedness, α = .82			
Item 12			.55
Item 13			.77
Item 14			.78
Item 15			.79
Item 16			.72

Note. N = 199, Eigenvalues: Factor 1 = 6.56, Factor 2 =1.79, Factor 3 = 1.45. Cronbach's α = .90 for entire measure. Total variance explained is 61.31%.

Table 2

Factor Loadings and Reliability for PLSPQ Six-Factor Solution

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Factor 1: Visual, α = .91						
Item 6	.89					
Item 12	.88					
Item 29	.86					
Item 10	.84					
Item 24	.80					
Factor 2: Group, α = .88						
Item 5		.86				
Item 21		.79				
Item 3		.77				
Item 23		.75				
Item 4		.73				
Factor 3: Individual, α = .86						
Item 27			.77			
Item 28			.80			
Item 13			.56			
Item 18			.63			
Item 30			.82			
Factor 4: Tactile, α = .83						
Item 16				.79		
Item 14				.69		
Item 25				.66		
Item 11				.64		
Item 22				.62		
Factor 5: Kinesthetic, α = .80						
Item 15					.79	
Item 8					.68	
Item 2					.66	
Item 26					.66	
Item 19					.45	
Factor 6: Auditory, α = .75						
Item 20						.74
Item 9						.73
Item 7						.69

Item 17	.57
Item 1	.53

Note. N = 199, Eigenvalues: Factor 1 = 7.20, Factor 2 = 4.73, Factor 3 = 3.44, Factor 4 = 1.79, Factor 5 = 1.30, Factor 6 = 1.18, Cronbach's α = .88 for entire measure. Total variance explained is 65.52%.

Results and Discussion of Research Question 1

Research question 1 explored if there are any differences on perceptual learning style preferences between low-autonomy EFL online learners and high-autonomy EFL online learners. Before answering the research question, learners were first classified into three autonomy groups based on their total scores on autonomy scale. Learners whose scores were smaller than the score of 27th percentile (i.e., < 18) were judged to be the low-autonomy group (n = 161); those whose scores were larger than the score of 73rd percentile (i.e., > 23) were judged to be the high-autonomy group (n = 181). Scores between the 27th and 73rd percentiles (n = 156) were omitted from the analysis. To answer research question 1, an independent samples t-test was employed. The results revealed that there were significant differences between the mean scores of two groups on visual, t (340) = -3.33, p = .001, d = 0.36, auditory, t (340) = -7.34, p < .001, d =0.79, tactile, t (340) = -9.58, p < .001, d = 1.03, kinesthetic, t (340) = -7.90, p< .001, d = 0.85, individual, t (340) =-2.36, p = .019, d = 0.25, and group, t (340) = -.7.61, p < .001, d = 0.82 (see Table 3). Taken together, these results suggest that autonomy need satisfaction did have an effect on EFL online learners' perceptual learning style preferences. Specifically, the results suggest that when EFL online learners had high levels of autonomy need satisfaction, they tended to employ more sensory (visual, auditory, tactile, and kinesthetic) learning styles and sociological (individual and group) learning styles while attending online English courses. These results seem to partially support Foroutan, Nooreen, Gani, and Baki's (2013) finding that autonomy was positively related to auditory style, kinesthetic style, visual style, and tactile style, and Mojgan and Nematipour's (2012) finding that visual and auditory learning styles were significantly and positively related to learner autonomy. To explain the positive effect of autonomy on perceptual learning style use, we should look at the online learning environment providing the flexibility of time and space as well as demanding learner independence, learner autonomy, and motivation.

Therefore, we can assume that more instructor control and less student control may ruin students' motivation. This assumption can be supported by Xie, Debacker, and Ferguson's (2006) study. They investigated online discussions and found that instructor control negatively influenced students' motivation because their participation in online discussions was mandatory. Once students' motivation decreased, they might employ fewer perceptual learning style preferences because more motivated learners were found to exhibit a greater variety of perceptual learning style use compared to less motivated ones (Wu, 2010).Thus, we can infer that high-autonomy EFL online learners tended to employ more perceptual learning style preferences compared with low-autonomy ones.

Table 3

Learning Style Differences Between Low-Autonomy EFL Online Learners (n =161) and High-Autonomy EFL Online Learners (n =181)

| Learning style | Low | | High | | | |
	Mean	*SD*	*Mean*	*SD*	*t*	*p*
Visual	14.24	2.64	15.22	2.76	-3.33	.001
Auditory	15.32	3.05	17.59	2.65	-7.34	.000
Tactile	14.90	2.84	17.94	2.99	-9.58	.000
Kinesthetic	14.44	2.84	16.93	2.96	-7.90	.000
Individual	13.26	3.31	14.11	3.36	-2.36	.019
Group	16.29	3.39	18.95	3.04	-7.61	.000

Results and Discussion of Research Question 2

Research question 2 explored if there are any differences on perceptual learning style preferences between low-competence EFL online learners and high-competence EFL online learners. Before answering the research questions, learners were first classified into three competence groups based on their total scores on competence scale. Learners whose scores were smaller than the score of 27th percentile (i.e., < 13) were judged to be the low-competence group (n = 169); those whose scores were larger than the score of 73rd percentile (i.e., > 16) were judged to be the high-

competence group (n = 184). Scores between the 27th and 73rd percentiles (n = 145) were omitted from the analysis. To answer question 2, an independent samples t-test was employed. The results revealed that there were significant differences between the mean scores of two groups on visual, t (351) = -5.02, p < .001 , d = 0.53, auditory, t (326.44) = -2.65, p = .008, d = 0.29, tactile, t (351) = -3.38, p = .001, d = 0.36, kinesthetic, t (351) = -4.33, p < .001, d = 0.46, individual, t (351) = -6.12, p < .001, d = 0.65, and group, t (262.16) = -.3.10, p = .002, d = 0.38, (see Table 4). Taken together, these results suggest that competence need satisfaction did have an effect on EFL online learners' perceptual learning style preferences. Specifically, the results suggest that when EFL online learners had high levels of competence need satisfaction, they tended to employ more sensory (visual, auditory, tactile, and kinesthetic) learning styles and sociological (individual and group) learning styles while attending online English courses. These findings seem to support Arifin's (2014) finding that there were some differences in using learning styles by the students of high, middle and low levels of competence.

One possible explanation to the positive effect of competence need satisfaction on EFL online learners' perceptual learning style use might be related to the student-centered online learning environment highly demanding a variety of skills, such as computer efficacy, CMC efficacy, and self-regulated learning strategies. Because many frustrations of online learners are ability-related (Chen, Jang, & Branch, 2010), students need to be prepared for technology, learning management, and pedagogical practice to ensure online learner satisfaction to occur (Vonderwell & Zachariah, 2005). If students feel incompetent using technologies, or if they encounter technical problems without timely help, they might feel anxious, awkward, and distressed (Motteram & Forrester, 2005; Xie et al., 2006). Additionally, online learners' perceived ability is a strong predictor of motivation and learning outcomes (Lim, 2001; Thompson, Meriac, & Cope, 2002).If motivation will be facilitated by competence need satisfaction (Deci & Ryan 2000, as cited in Betoret & Artiga, 2011), and motivation is related to perceptual learning style use (Wu, 2010), positive connections can be inferred between competence need satisfaction and perceptual learning style preferences.

Table 4

Learning Style Differences Between Low-Competence EFL Online Learners (n =169) and High –Competence EFL Online Learners (n =184)

Learning style	Low		High		t	p
	Mean	*SD*	*Mean*	*SD*	*t*	*p*
Visual	14.07	2.93	15.57	2.68	-5.02	.000
Auditory	16.41	3.27	17.26	2.70	-2.65	.008
Tactile	16.26	3.47	17.44	3.07	-3.38	.001
Kinesthetic	15.18	3.11	16.61	3.05	-4.33	.000
Individual	12.55	3.69	14.78	3.15	-6.12	.000
Group	17.10	4.09	18.26	2.77	-3.10	.002

Results and Discussion of Research Question 3

Research question 3 explored if there are any differences on perceptual learning style preferences between low-relatedness EFL online learners and high-relatedness EFL online learners. Before answering the research questions, learners were first classified into three relatedness groups based on their total scores on relatedness scale. Learners whose scores were smaller than the score of 27th percentile (i.e., < 14.73) were judged to be the low-relatedness group (n = 134); those whose scores were larger than the score of 73rd percentile (i.e., > 23) were judged to be the high-relatedness group (n = 139). Scores between the 27th and 73rd percentiles (n = 225) were omitted from the analysis. An independent samples t-test revealed that there were significant differences between the mean scores of two groups on visual, t (271) = -2.58, p = .010 , d = 0.31, auditory, t (271) = -4.58, p < .001, d = 0.55, tactile, t (271) = -5.85, p < .001, d = 0.71, kinesthetic, t (271) = -5.45, p < .001, d= 0.66, and group, t (237.66) = -7.89, p < .001, d = 1.02 , but not on individual, t(271) =-1.25, p = .211 (see Table 5). Taken together, these results suggest that relatedness need satisfaction did have an effect on EFL online learners' perceptual learning style preferences. Specifically, the results suggest that when EFL online learners had high levels of relatedness need satisfaction, they tended to employ more visual, auditory, tactile, kinesthetic, and group learning styles while attending online English courses. These results seem to partially

support Smith's (2008) finding that there was a highly significant difference in sense of social community (the student's feelings of general social connectedness to instructors and peers) among learning style groups.

Table 5

Learning Style Differences Between Low-Relatedness Learners (n =134) and High-Relatedness Learners (n =139)

Learning style	Low		High			
	Mean	*SD*	*Mean*	*SD*	*t*	*p*
Visual	14.32	2.90	15.23	2.89	-2.58	.010
Auditory	15.73	3.38	17.45	2.80	-4.58	.000
Tactile	15.52	3.34	17.80	3.09	-5.85	.000
Kinesthetic	14.85	3.18	16.84	2.86	-5.45	.000
Individual	13.05	3.74	13.58	3.23	-1.25	.211
Group	16.00	3.94	19.27	2.76	-7.89	.000

To explain the finding that relatedness had a positive effect on perceptual learning style preferences, we can consider the online learning environment in the present study. In contrast with the stereotyped assumption that online learners should learn independently and autonomously in an isolated online learning context, online learners still have the needs for relatedness. To fulfill the need for relatedness, the participants in the present study have to constantly interact with their teachers and classmates through instant messenger, chat room, or e-mail. Since social interaction and student affiliation significantly impacted student motivation and learning outcomes (Marks, Sibley, & Arbaugh, 2005), and more motivated learners were found to exhibit a greater variety of perceptual learning style use compared to less motivated ones (Wu, 2010), we can infer that EFL online learners with high levels of relatedness satisfaction are more likely to have high levels of perceptual learning style use.

Conclusions

To explore the relations of autonomy, competence, and relatedness to EFL online learners' learning style preferences, this study provides empirical evidence to show that autonomy, competence, and relatedness need satisfaction

have effects on EFL online learners' perceptual learning style preferences, suggesting that when EFL online learners have high levels of autonomy, competence, and relatedness need satisfaction, they tend to employ more perceptual learning styles while attending online English courses. From these findings, we can assume that EFL online learners' levels of perceptual learning style use go hand in hand with the levels of their need satisfaction. Therefore, for EFL online learners, they need to find ways to strengthen their technological abilities, foster their autonomy, and build up their relationships with web teachers and online classmates in order to result in the adoption of a wider variety of perceptual learning styles. This, in turn, can bring about better learning outcomes (Cohen& Dörnyei, 2002, as cited in Wu, 2010). For Web teachers, in order to broaden the learning style repertoire of EFL online learners, more emphasis should be put onto fostering their need satisfaction. First, they need to promote EFL online learners' autonomy by providing choice for learning activities, and minimizing pressure and control. Next, they should enhance EFL online learners' competence by providing technical orientations and learning management to them. Moreover, they should enhance learners' relatedness need satisfaction by creating an interactive learning environment, and conveying warmth, caring, and respect to students. Once EFL online learners' need satisfaction increase, they will use more perceptual learning styles that would better equip themselves to meet the requirements of learning tasks of different natures (Cohen & Dörnyei, 2002, as cited in Wu, 2010).

Since the present researcher only examined the need satisfaction and perceptual learning style preferences of EFL online learners studying in an evening university program in Taiwan, transferring these findings across different settings must be done with caution. Although the relation of need satisfaction to perceptual learning style preferences can be inferred from the relationship between intrinsic motivation and perceptual learning style preferences because intrinsic motivation can be facilitated by psychological need satisfaction (Deci & Ryan 2000, as cited in Betoret & Artiga, 2011), future studies should address the possible mediating effects between intrinsic motivation and perceptual learning style preferences.

Reference

Alm-Lequeux, A. (2004). CALL IT motivation: On competence, relatedness and autonomy in computer-assisted language learning environments. In G. Wigglesworth (Ed.), *Proceedings of the Marketing Our Difference Conference*, 157-170. University of Melbourne.

Arifin, Z. (2014). *Learning styles of SMPN students of Dagangan Madiun and their* Implication *to English teaching*. Post-graduate Program Research Paper, Muhammadiyah University of Surakarta,

Berberoglu, G., Sireci, S.G. (1996). *Evaluating translation fidelity using bilingual examines.* Laboratory of Psychometric and Evaluate Research. Report no. 285. University of Massachusetts, Amherst, MA

Betoret, F. D., & Artiga, A. G (2011). The relationship among student psychological need satisfaction, approaches to learning, reporting of avoidance strategies and achievement electronic. *Journal of Research in Educational Psychology, 9 (2)*, 1-36.

Brett, P. (1996). Multimedia applications for language learning—what are they and how effective are they? In M. Dangerfield, G. Hambrook, & L. Kostova (Eds.), *East to West.* Varna, Bulgaria.

Carr, S. (2000). As distance education comes of age, the challenge is keeping the students. *Chronicle of Higher Education, 46*(23), A39-A41.

Chen, K. C., Jang, S. J., & Branch, R. M. (2010). Autonomy, affiliation, and ability: Relative salience of factors that influence online learner motivation and learning outcomes. *Knowledge Management & E-Learning: An International Journal, 2*(1), 30–50.

Chen, P. T. (2005). *Junior high school students' vocabulary learning strategies and learning styles.* Unpublished master's thesis, Taiwan Normal University, Taiwan

Cheng, M. H., & Banya, K. (1998). Bridging the gap between teaching and learning styles. In J. Reid (Ed.). Understanding learning styles in the second language classroom (pp. 80-84). USA: Prentice Hall Regents.

Cohen, V. (2001). Learning styles and technology in ninth-grade high school population. *Journal of Research on Computing in Education, 33*(4), 355-366.

Collinson, E. (2000). A survey of elementary students' learning style preferences and academic success. *Contemporary Education, 71*(4), 42-48.

Deci, E. L., & Ryan, R. M., (1985). *Intrinsic motivation and self-determination in human behavior.* New York: Springer.

Deci, E. L., & Ryan, R. M. (1991). A motivational approach to self: Integration in personality. In R. Dienstbier (Ed.), *Nebraska symposium on motivation, vol. 38: Perspectives on motivation* (pp. 237–288). Lincoln, NE: University of Nebraska Press.

Deci, E. L., & Ryan, R. M. (2000). The what and why of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, Vol. 11*(4), 227-268.

Deci, E. L., & Ryan, R. M. (2002). *Handbook of self-determination research.* Rochester, NY: University of Rochester Press.

Dennen, V. P., Darabi, A. A., & Smith, L. J. (2007). Instructor-learner interaction in online courses: The relative perceived importance of particular instructor actions on performance and satisfaction. *Distance Education, 28*(1), 65–79.

Drennan, J., Kennedy, J., & Pisarki, A. (2005). Factors affecting student attitudes toward flexible online learning in management education. *Journal of Educational Research, 98*(6), 331–338.

Foroutan, M., Nooreen, N., Gani, S.H. Baki, R. (2013). The relationship between language learning autonomy extent and learning styles in Malaysian context *World Applied Sciences Journal 24 (3)*, 395-402

Gao, T., & Lehman, J. D. (2003). The effects of different levels of interaction on the achievement and motivational perceptions of college students in a web-based learning environment. *Journal of Interactive Learning Research, 14*(4), 367–386.

Howland, J. L., & Moore, J. L. (2002). Student perceptions as distance learners in Internet-based courses. *Distance Education, 23(2*), 183–195.

Hu, P. J., Hui, W., Clark, T. H. K., Milton, J., Ma, W., & Tam, K. Y. (2005). Examining e-learning effectiveness, outcomes and learning style: a longitudinal field experiment. *Paper presented at the Pacific Asia Conference on Information System.* Tailand: Bangkok.

Jaggars, S. S., Edgecombe, N., & Stacey, G. W. (2013). *What we know about online course outcomes.* New York, NY: Columbia University, Teachers College,Community College Research Center.

Johnson, D. W., Johnson, R. T., & Holubec, D. L. (1990). *Circle of learning: Cooperation in the classroom.* Edina, MN: Interaction Book.

Kinsella, K. (1995). Understanding and empowering diverse learners in ESL classroom. In M. J. Reid (Ed.), *Learning styles in the ESL/EFL classroom,* (pp. 74-86). Boston, MA: Heinle & Heinle Publishers.

Klein, J. D., & Schnackenberg, H. L. (2000). Effects of informal cooperative learning and the affiliation motive on achievement, attitude, and student interactions. *Contemporary Educational Psychology, 25(3)*, 332-341.

Konradt, U., Filip, R., & Holfmann, S. (2003). Flow experience and positive affect during hypermedia learning. *British Journal of Educational Technology, 34*(3), 309-327.

Kowal, J., & Fortier, M. S. (1999). Motivational determinants of flow: Contributions from self-determination theory. *The Journal of Social Psychology, 139(3)*, 355-368.

Lamboy, C. L. (2003). *Using technology in an English as a second language course to accommodate visual, kinesthetic, and auditory learners to affect students' self-efficacy about learning the language.* Unpublished doctoral dissertation, Nova Southeastern University, Fort Lauderdale,Florida.

Lin, T. L. (2010). *The effect of teacher support on basic needs and learning engagement in Taiwanese high school context.* Unpublished doctor's dissertation, National Chengchi University.

Ma, J. H. (2013). What is your teaching philosophy? *KATE Forum, 37*(1)*,* 17–22.

Marks, R. B., Sibley, S. D., & Arbaugh, J. B. (2005). A structural equation model of predictors for effective online learning. *Journal of Management Education, 29*(4), 531–563.

Mojgan Nematipour (2012). A Study of Iranian EFL Learners' Autonomy Level and its Relationship with Learning Style. *English Linguistics Research, 1*(1); 2012, 126-136

Motteram, G., & Forrester, G. (2005). Becoming an online distance learner: What can be learned from students' experiences of induction to distance programs? *Distance Education*, *26*(3), 281–298.

Murray, M. R. (2004). *An Exploration of the kinesthetic learning modality and virtual reality in a web* 219 *environment.* Unpublished Doctoral Dissertation, Brigham Young University. Salt Lake City, UT.

Ng, S. F. & Confessore, G. J. (2010). The relationship of multiple learning styles to levels of learner autonomy. International Journal of Self-directed Learning, 7(1): 1-13.

Reid, J. (1987). The learning style preferences of EFL students. *TESOL Quarterly, 21*(1), 87-111.Reid, J. (1995). *Learning styles in the ESL/EFL Classroom.* Boston: Heinle & Heinle Publishers.

Rovai, A. P. (2002). Sense of community, perceived cognitive learning, and persistence in asynchronous learning networks. *Internet & Higher Education, 5*(4), 319–332.

Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*, 54–67. Retrieved from http://mmrg.pbworks.com/f/Ryan,+Deci+00.pdf

Ryan, R. M., & Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78.

Ryan, R. M., & Deci, E. L. (2002). Overview of self-determination theory: An organismic dialectical perspective. In E.L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 3–33). Rochester, NY: University of Rochester Press.

Shen, M. Y. (2010). Effects of perceptual learning style preferences on L2 lexical inferencing. *System, 38,* 537-547.

Smith, D. R. (2008). *Learning style preference, sense of classroom Community, gender, age, and previous experience within computer-mediated instruction (CMI).* Doctoral dissertation, The University of North Carolina at Greensboro (UNCG), North Carolina,U.S.A.

Standage, M., Duda, J. L., & Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *British Journal of Educational*

Psychology, 75, 411–433.

Standage, M., Duda, J. L., & Ntoumanis, N. (2006). Students' motivational processes and their relationship to teacher ratings in school physical education: A self-determination theory approach. *Research Quarterly for Exercise and Sport, 77*(1), 100–110.

Sy, B. M. (2003). The language learning styles and strategies of Chinese EFL students. *Selected papers from the twelfth international symposium on English teaching,* Taipei, Taiwan.

Tai, F. M. (2013). Adult EFL students' preferred learning styles and motivation. The *Journal of Human Resource and Adult learning, Vol. 9*, Num. 2, 161-169.

Tait, A. (2003). Rethinking learner support in the Open University UK. In A. Tait & R. Mills (Eds.), *Rethinking learner support in distance education: Change and continuity in an international context* (pp. 185–197). London: Routledge.

Thompson, L. F., Meriac, J. P., & Cope, J. G. (2002). Motivation online performance: The influence of goal setting and Internet self-efficacy. *Social Science Computer Review, 20*(2), 149–160.

Verhoeven, J. C., Heerwegh, D. & De Wit, K. (2012). "First year university students' self-perception of ICT skills: Do learning styles matter?" *Education and Information Technologies, Vol. 17 (1)*: 109-133.

Vonderwell, S., & Zachariah, S. (2005). Factors that influence participation in online learning. *Journal of Research on Technology in Education, 38*(2), 213–230.

Wegerif, R. (1998). The social dimension of asynchronous learning networks. *Journal of Asynchronous Learning Networks, 2*(1), 34–49.

Wu, M. M. (2010). An exploratory study of the language learning style preferences and language learning motivation of ESL learners at a vocational education institute in Hong Kong. *Electric Journal of Foreign Language Teaching, 7(1)*, 222-238.

Xie, K., Debacker, T. K., & Ferguson, C. (2006). Extending the traditional classroom through online discussion: The role of student motivation. *Journal of Educational Computing Research, 34*(1), 67–89.

Xie, K., Durrington, V., & Yen, L. L. (2011). Relationship between students' motivation and their participation in asynchronous online discussions. *MERLOT Journal of Online Learning and Teaching*, *7*(1), p. 17–29.

Zimmer-Grembeck, M. J., Chipuer, H. M., Hanisch, M., Creed, P. A., & McGregor, L. (2006). Relationships at school and stage-environment fit as resources for adolescent engagement and achievement. *Journal of Adolescence, 29*(6), 911–933.