Using Online Instruments to Assess Learning Styles of Health Professions Students: A Pilot Study

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ABSTRACT
Understanding their own learning styles can assist students as they relate to one another and ultimately to their future clients. **Purpose:** The purpose of this study was to describe the preferred learning and personality styles of a convenience sample of Central Michigan University students enrolled in the following health-related professions: Athletic Training, Communication Disorders, Social Work, and Physician Assistant. **Method:** Students completed two self-administered online instruments used to measure learning styles, the VARK and the online version of the Keirsey Temperament Sorter II™ (KTS-II). Associations between VARK learning style scores and the online Keirsey Temperament Sorter II™ results were also examined. **Results:** Seventy-four percent of the students scored as Guardians (Sensing-Judging) based on the online KTS-II report and 62% were multimodal learners on the online version of the VARK. **Conclusion:** This study confirmed previous findings that Guardian is the preferred temperament type on the MBTI/KTS-II for health professions students. Average scores on the VARK and the Keirsey did not differ between the various health-related disciplines; however, students scoring as Idealists (Intuition/Feeling) on the Keirsey had significantly higher Aural scores on the VARK when compared to those with Guardian temperaments. There was no significant difference found between Keirsey groups and how they scored on Vark-V (Visual), R/W (Read/Write), or K (Kinesthetic) learning style dimensions.

INTRODUCTION
Self-knowledge is fundamental to assisting students in "helping" professions develop healthy therapeutic relationships with their clients.[1] Online learning styles assessments can be used in both traditional and online classes to encourage health professions

students' introspection and self-awareness. With today's emphasis on technology, the value of self-reflection is frequently overlooked.

The VARK and Myers-Briggs Type Indicator/Keirsey Temperament Sorter II™ are two commonly used instruments for determining learning styles. Online versions of these tools are free and easy-to-administer making them ideal for classroom assessment activities in either face-to-face or in online settings. The Keirsey Temperament Sorter II™ is based on the Myers-Briggs Type Indicator (MBTI) which was introduced in 1962 and was one of the early instruments used for assessing learning styles.[2] The Myers-Briggs Type Indicator assesses learning style based on personality type.[2] Released in 1989, the VARK was developed by Neil Fleming and was designed to measure instructional preferences for giving and receiving information.[3]

Learning styles instruments have been studied frequently in relation to career choice. In fact, the Myers-Briggs was designed to be used in career assessment.[4] Evidence from the literature supports that health professions students score differently on learning styles instruments when compared to the general population. Four studies employing the Myers-Briggs Type Indicator/Keirsey Temperament Sorter II™ with health professions students have confirmed these findings.[5-8] Several studies of students in various health professions using the VARK have found higher Kinesthetic preferences than would be expected from the general public.[9-11]

While learning style research has been extensive, little research has been done utilizing the online versions of learning styles instruments with health professions students. This was an exploratory pilot study to determine the primary learning styles for students enrolled in selected health professions majors at Central Michigan University and to examine and describe any associations between the scores on the online versions of the VARK and the Keirsey Temperament Sorter II™.

LITERATURE REVIEW
Learning and Personality Style Instruments
Learning and personality styles of health professions students and practitioners have been assessed using a variety of instruments including the Kolb Learning Styles Inventory, Productivity Environmental Preference Survey, Gregorc Style Delineator, Myers-Briggs Type Indicator, and the VARK Inventory.[5-31]

The MBTI "provides a view of the whole personality including learning" using four scales: Introversion (I) vs. Extraversion (E); Intuition (N) vs. Sensation (S); Thinking (T) vs. Feeling (F); and Judging (J) vs. Perceiving (P).[2] Keirsey and Bates published a 70-question abbreviated version of the Myers-Briggs Type Inventory in their book, *Please Understand Me – Character & Temperament Types*.[32] In 1984, a subsequent edition of Keirsey and Bates' book introduced the concept of four basic temperament types on which the Keirsey Temperament Sorter II™ is based.[33] The four temperament types are – SJ (Sensing/Judging), SP (Sensing/Perceiving), NT (Intuition/Thinking), and NF (Intuition/Feeling).[33]

More recently, a widely used online version of the Keirsey Temperament Sorter II™ has been developed and is available at www.keirsey.com.[34] The Keirsey™ Temperament Mini Report assigns a score of one of four temperament types – Rationals (Intuitive/Thinking); Artisans (Sensing/Perceiving); Idealists (Intuitive/Feeling); and Guardians (Sensing/Judging). Distribution of scores within previously reported and computed populations for these four temperaments is reported as follows: Sensing/Perceiving (38%), Sensing/Judging (38%), Intuitive/Thinking (12%), and Intuitive/Feeling (12 %).[33]

VARK is an acronym for Visual, Aural, Read/Write, and Kinesthetic. A visual learner prefers charts, symbols, and graphs. Aural learners reflect a preference for auditory learning such as oral presentations and discussion. Books, manuals, and lists are preferred by those with a Read/Write preference. Kinesthetic as used in the VARK refers to "learning by doing" where students utilize many senses to learn including pictures, movies, videos, and animated websites. On the VARK, pictures and multimedia are associated with a Kinesthetic learning preference rather than a Visual preference. Those taking the VARK can have a single learning preference or may be determined to be multimodal with multiple learning preferences. Multimodal scores may indicate two learning preferences (bimodal), three learning preferences (trimodal), or all four preferences. In composite populations tabulated by the VARK developer, nearly two-thirds (62.7%) of people taking the VARK are judged to be multimodal. For those having a single learning preference on the VARK, 3.4% are Visual, 7.5% are Aural, 14.6% are Read/Write, and 11.8% are Kinesthetic.[3]

Review of Learning Styles of Health Professions Students
A number of studies have examined the learning styles of health professions students using the Myers-Briggs Type Indicator/Keirsey Temperament Sorter II ™ or the VARK. Table 1 summarizes the results of eleven studies.

The majority of studies have determined Sensing/Judging (Guardian) to be the preferred learning/personality style of health professions students on the Myers-Briggs Type Indicator/Keirsey Temperament Sorter II™.[5-8] Shuck and Phillips reported the primary MBTI personality type for a large sample of pharmacy students was ISTJ (Intoverted, Sensing,Thinking, Judging).[8] Using the Myers-Briggs Type Indicator to assess health professions students, Hardigan and Cohen reported the following dominant profiles by discipline: Osteopathic and Physician Assistant – ESTJ (Extroverted, Sensing, Thinking, Judging); Physical and Occupational Therapy – ESFJ (Extraverted, Sensing, Feeling, Judging) and Pharmacy – ISTJ (Introverted, Sensing, Thinking, Judging).[7] A study of pharmacy students using the Keirsey Temperament Sorter™ also found Sensing-Judging to be the preferred profile (Sensing 55.1% vs. Intuition 35.9% and Judging 86.5% vs. Perceiving 11.5%).[6] In addition, DiMarco and colleagues reported that a majority of senior physical therapy students were identified as Sensing/Judging on the self-scoring MBTI.[5]

Table 1. Learning Styles of Health Professions Students on the MBTI/Keirsey or VARK

Study/Instrument	Student Population	Learning Style
DiMarco et al. (1997)[5] MBTI –Self scoring version	Physical therapy	SJ
Draugalis & Bootman (1986)[6] Keirsey Temperament Sorter	Pharmacy	SJ
Hardigan & Cohen (1998)[7] MBTI	Osteopathic Pharmacy Physical therapy Physician assistant Occupational therapy	ESTJ ISTJ ESFJ ESTJ ESFJ
Rezler & French (1975)[28] MBTI	Medical arts Dietetics Laboratory sciences Medical records administration Occupational therapy Physical therapy	Judging preferred over perception in all groups except occupational therapy
Shuck & Phillips (1999)[8] MBTI	Pharmacy	ISTJ, ISFJ
Baykan & Nacar (2007)[29] VARK	Medical	Multimodal-64% V-3% A-8% R-2% K-23%
Brekler et al. (2009)[30] VARK	Physiology class, interested in health professions	Multimodal -60% V-4% A-5% R-15% K16%
Brown et al. (2008)[9] VARK	Occupational therapy Physical therapy Speech pathology	Multimodal -33% K-33%
Marcy (2001)[31] VARK	Physician assistant	Multimodal-72% V-0% A-0% R-22% K-6%
Meehan-Andrews (2009)[10] VARK	Nursing	Multimodal-46% V-11% A-4% R-17% K-68%
Slater et al. (2007)[11] VARK	Medical	Multimodal-56% V-5% A-5% R-11% K-22%

In an earlier study of allied health professions students from six disciplines (Medical Arts, Dietetics, Laboratory Sciences, Occupational Therapy, Records Administration, and Physical Therapy), Judging over Perception was predominant in all groups except Occupational Therapy.[28] The authors concluded that students scoring highly in the Judging dimension "prefer to proceed in a planned, orderly manner with control over their environment." Unlike the other studies, however, Sensing was not preferred over Intuition with approximately an equal split found on this dimension.

VARK results of health professions students have been reported in several studies. Four of six studies reported that a majority of their subjects were multimodal.[11,29-31] This is also reflective of VARK results for the general population where 62.7% score as being multimodal.[3] Three studies reported higher Kinesthetic preferences than would be expected from the general public.[9-11] Students enrolled in an upper level physiology class who took the VARK were determined to be 60% multimodal.[30] In this study, the preferred styles of students with unimodal preferences were Kinesthetic 16%, Reading/Writing 15%, Aural 5%, and Visual 4%.[30] Investigating VARK learning styles of 18 Physician Assistant students, Marcy reported that 72% were multimodal, 22% had a single Read/Write preference, and 6% had a single Kinesthetic preference.[31] None of the 18 students studied had Aural or Visual preferences. Slater et al investigated gendered distribution on the VARK learning style in medical students.[11] Results reported on both sexes were as follows: Multimodal 56%; Single Visual 5%, Single Aural 5%, Single Reading 11%, and Single Kinesthetic 22%. Fourteen percent of this group of medical students were bimodal, 16% were trimodal, and 26% had four preferences. A recent study of first-year medical students in Turkey also found a high percentage of multimodal learners (63.9%) and a preference for Kinesthetic learning (23%).[29] Unlike the studies reported above, however, where Reading/Writing was the primary or secondary preference, this study reported Reading/Writing to be the least favored with only 1.9% of the students scoring highest on Reading/Writing.

PURPOSE
The purpose of this study was to:
1. Determine the primary learning style and personality profile for students enrolled in selected Health Professions majors (Athletic Training, Communication Disorders, Social Work, and Physician Assistant) at Central Michigan University on the online versions of the Keirsey Temperament Sorter II ™ and the VARK.
2. Examine and describe any associations between VARK learning styles scores and the Keirsey Temperament Sorter II™ results.

METHOD
The design of the study was a cohort survey utilizing a convenience sample.

Participants
Following study approval by the Institutional Review Board, Central Michigan University students enrolled in on-campus courses in fall 2008 taught by faculty authors were invited to participate in this study. Participation was voluntary and participants were not paid or otherwise compensated. Students who chose to participate signed consent forms and received instructions for completing the online versions of the VARK Learning Styles instrument and the Keirsey™ Temperament Sorter II™. One hundred ten students participated with the following distribution by major: Athletic Training 5; Communication Disorders 83; Physician Assistant 9, and Social Work 13. Sixty-four percent of the participants were undergraduates, 32% were enrolled in a Masters degree program, and 4% in a Doctorate program. Age and gender information were not collected; however, the vast majority of participants were traditional college age students ages 18 to 25 with both genders represented.

Instruments
The online versions of the VARK at http://www.vark-learn.com/english/page.asp?p=questionnaire and the online version of the Keirsey Temperament Sorter™ (KTS™-II) http://www.keirsey.com/sorter/register.aspx are both self-administered instruments available without charge on the Internet. Permission to use the VARK was obtained (©Copyright Version 7.0 (2006) held by Neil D. Fleming, Christchurch, New Zealand and Charles C. Bonwell, Green Mountain Falls, Colorado 80819 USA). Both instruments were taken and scored online and could be completed in 10 to 20 minutes.

Consisting of 16 questions, the VARK provides participants with their scores on four learning style dimensions: Visual, Aural, Read/Write, and Kinesthetic. Each of the VARK's 16 questions presents four possible answers. Users were instructed to select more than one answer if a single answer did not match their perception. The online version of the VARK reports the user's score from 0-16 on each of the four dimensions (V,A,R,K). An arithmetic method (VARK website) using the algorithm in *Teaching and Learning Styles – VARK Strategies* was employed to determine scores.[3] If no single preference for V, A, R, or K was assigned, students were determined to be biomodal, trimodal, or to have all four preferences.[35] Recently, Leite et al reported reliability

estimates for VARK subscales scores of .85 (visual), .82 (aural), .84 (read/write), and .77 (kinesthetic) "which are considered adequate."[36] Longitudinal studies showing persistence of VARK scores have not been conducted.

The Keirsey Temperament Sorter II™ based on the Myers-Briggs Type Indicator (MBTI) dimensions of Sensing (S) vs. Intuition (N); Feeling (F) vs. Thinking (T); Introversion (I) vs. Extroversion (E); and Judging (J) vs. Perceiving (P) consists of 70 forced choice questions where one of two options must be selected for each question. After completing the online instrument, the scores are tallied automatically online and the user receives a free Keirsey™ Temperament Mini Report assigning one of four temperament types - Artisan (SP), Guardian (SJ), Rational (NT), or Idealist (NF). The Myers-Briggs Type Indicator (MBTI) has been demonstrated to have internal consistency and test-retest reliability.[2] However, the MBTI does not show construct or predictive validity. In a longitudinal study of graduate students, psychological type as measured by the Myers-Briggs Type Indicator was found to be persistent over a two-year period.[37] Kelly et al reported concurrent validity between the MBTI and the Keirsey Temperament Sorter™ (KTS™-II).[38]
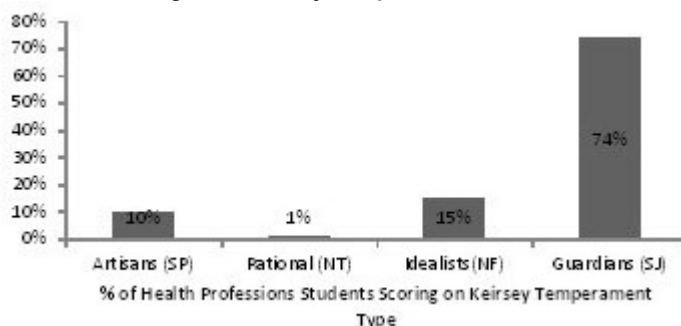
DATA ANALYSIS
Data were analyzed using a SPSS statistical software package and are descriptive in nature, utilizing frequency counts and percentages. Also, a one-way ANOVA ($p \leq 0.05$) was used to determine whether average VARK scores (i.e. Visual, Aural, Read/Write, Kinesthetic) were equal across Keirsey groups (i.e., Artisan, Guardian, Rational, Idealist). For the ANOVA analysis, the raw VARK scores were used. Finally, in order to determine which group or groups mean differed significantly from the others, post hoc comparisons using the Bonferroni post hoc test ($p \leq 0.05$) were performed.
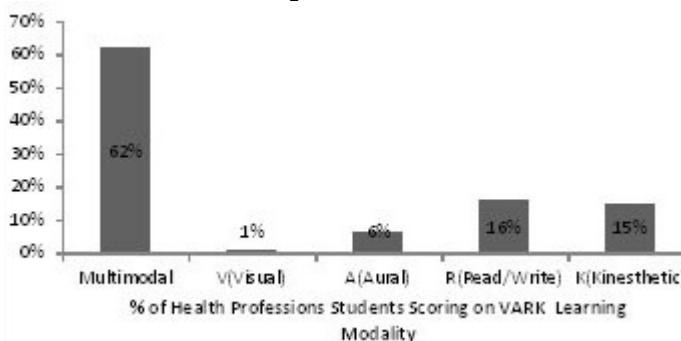
RESULTS
Nearly three-quarters of the 110 students completing the Keirsey Temperament Sorter II ™ scored as Guardians (SJ). Fifteen percent of student were Idealists (NF), 10% Artisans (SP), and <1% Rationals (NT). Figure 1 summarizes scores on the Keirsey.

Figure 1. Keirsey Temperament Sorter

On the VARK, 62% of the students were found to be multimodal learners. Thirty-eight percent of the students had unimodal preferences, 13% were bimodal, 14% trimodal and 35% had four preferences. For those students scoring highest on a single learning preference, the preferred learning modes were Read/Write (16%) and Kinesthetic (15%). The most frequent VARK learning style preferences, either as a single preference or occurring somewhere in the profile of multimodal learners, were also Reading (72%) and Kinesthetic (71%). The findings on the VARK are summarized in Figure 2.

Figure 2. VARK

Students Aural scores on the VARK (i.e., VARK-A) differed significantly across Keisey groups, [F (2,106) = 3.77, p = 0.026]. Specifically, the data revealed that Idealists differed significantly from Guardians with respect to VARK A (Bonferroni, p = 0.023). Idealists scored higher on Vark A, while Guardians scored lower. The group means for VARK A across Keirsey groups are presented in Table 2.

Table 2. Students with Aural Learning Style Relative to Keirsey Groups

Keirsey Group	n	Mean ✔	SD
Artisans (SP)	11	6.36	2.87
Idealists (NF)	17	7.76*	2.99
Guardians (SJ)	81	5.63*	2.94
Total	109	6.04	3.02

Note: ✔ The mean score can range from 0-16, *p <0.05

There was no significant difference found between Keirsey groups and how they scored on VARK-V (Visual), R/W (Read/Write) or K (Kinesthetic) learning style dimensions.

DISCUSSION

The results of this study support previous findings that the predominant learning/personality style of health professions students on the Myers-Briggs Type Indicator/Keirsey Temperament Sorter II™ is Sensing-Judging (Guardian).[5-8] Seventy-four percent of the students in this study were Guardians compared with 38% of the general population.[33] The Guardian temperament is described as helpful, hard-working, dependable, and focused on credentials and traditions.[34]

Interestingly, the least reported temperament type on the Keirsey in this group of students was Intuition/Thinking described as Rationals. Typically, the Intuition/Thinking temperament constitutes 12% of the population, but in this study, only 1% of the students had this temperament type.[33] The Intuition/Thinking temperament is described as being "logical and ingenious" and are "attracted to work with theoretical and technical developments."[4] Artisans (Sensing/Perceiving) were also underrepresented in this group of health professions students.

The VARK results for this study are similar to the findings reported for the general population. Sixty-two percent of the students from this study were multimodal learners. This mirrors findings in the general population where 62.7% score as multimodal learners (VARK book). Fifteen percent of the students in this study had a single Kinesthetic preference. Previous studies reported in Table 1 reported single Kinesthetic preference scores ranging from 6% to 68%.[9-11,29-31]

Average scores between the various health-related disciplines (Athletic Training, Communication Disorders, Social Work, Physician Assistant) were found not to differ significantly. In comparing VARK and Keirsey Temperament Sorter II™ results, there was one significant difference found. Students with the Keirsey Temperament type Idealist (Intuitive/Feeling) had higher mean VARK scores for A (Aural) (mean=7.76) than students with the Guardian (Sensing/Judging) temperament type (mean VARK aural score =5.63).

Limitations of this study include those related to the instruments chosen which were selected in part because they were freely available and easy to use. Neither reliability nor validity of the VARK have yet been determined and construct or predictive validity have not been established for the MBTI.[29,38] In addition, since this was a pilot study, the small sample size and uneven distribution of the number of students in each of the health professions disciplines limits generalizability of the findings.

CONCLUSION

This study of 110 students confirms previous findings using the MBTI/KTS-II that Guardian (Sensing-Judging) is the preferred temperament type for health professions students. Seventy–four percent of the students scored as Guardians compared to 38% of the general population. On the VARK, 62% of the students were found to be multimodal learners, reflective of the population at large. Kinesthetic learners were 15% of this study compared to 11.8% of the general population and 16% of this study had Read/Write preferences compared to 11.8% of the general population.

Average scores on the VARK and the Keirsey did not differ between the different health-related disciplines; however, students scoring as Idealists (Intuition/Thinking) on the Keirsey had significantly higher Aural scores on the VARK when compared to those with Guardian temperaments. There was no significant difference found between Keirsey groups and how they scored on Vark-V (Visual), R/W (Read/Write), or K (Kinesthetic) learning style dimensions.

Since this was a pilot study, future research would include repeating the study with larger sample sizes and achieving a more even distribution of students in each of the four health professions to determine whether significant differences continue to exist between Idealists and Guardians with respect to VARK A. Learning more about the nature of that difference would also be interesting. Those with strong Aural (VARK A) scores prefer to learn through hearing and speaking (VARK book) and Idealists (Intuitive/Feeling) are frequently found in the counseling profession. "Two-thirds of counselors and psychologists prefer Intuition, using association with Feeling."[4] Those involved in the counseling profession might be expected to have excellent listening skills and perhaps a preferred Aural learning style. Having a larger number of social work students and adding a comparison group of students in clinical psychology to see if there is a significant association for the Aural learning style with a preference for Intuition/Feeling on the Keirsey-Temperment Sorter II ™ would help test this hypothesis.

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