

## ORIGINAL RESEARCH

# Tolerance of ambiguity is not related to decision-making styles in undergraduate nursing students

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**Received:** September 22, 2023

**Accepted:** November 15, 2023

**Online Published:** November 29, 2023

**DOI:** 10.5430/jnep.v14n2p38

**URL:** <https://doi.org/10.5430/jnep.v14n2p38>

## ABSTRACT

Relationships of tolerance of ambiguity, decision-making style, risk-taking behaviors, and the use of supportive and complex care in end-of-life scenarios was investigated in this descriptive correlational study of 377 undergraduate nursing students. The mean for rational decision-making style was 2.332 (agree), while the overall mean for intuitive decision-making was 2.406 (range = 2.37 to 2.489) among all students although higher among sophomore students (2.489, SD = 0.655). The median tolerance of ambiguity scores was higher for juniors and seniors (9.00) compared to sophomore students (8.00). Intuitive decision-making was not associated with level of education. There was no statistically significant correlation between decision-making style and tolerance of ambiguity although there was a negative correlation between intuitive decision-making and tolerance of ambiguity ( $r_s = -0.031, p = .547$ ). Additionally, there was a negative small correlation between rational decision-making and tolerance of ambiguity ( $r_s = -0.040, p = .441$ ). Finally, there was a small statistically significant correlation for supportive care for vignette 1 ( $r_s = 0.119, p = .021$ ). All correlations between intuition decision-making and supportive care were low ( $r_s = -0.067-0.119$ ). In conclusion, decision-making style was not related to supportive care. Although intuitive decision-making style was used more frequently by sophomores, there was no statistically significant difference between level of education and decision-making style or tolerance of ambiguity.

**Key Words:** Decision making style, Intuition, Rational, Ambiguity, Continuation support care, End-of-life

## 1. INTRODUCTION

Understanding the process of clinical decision-making is essential to providing safe, efficient, and cost-effective patient care. Robust decision-making involves the analysis of knowledge and experience.<sup>[1,2]</sup> Critical thinking informs the decision-making process,<sup>[3]</sup> while clinical reasoning utilizes information learned, clinical experience, and principles to guide decisions.<sup>[4]</sup> Both critical thinking (type I thinking or rational thinking) and clinical reasoning (type II thinking,

intuition) are complementary.<sup>[5-7]</sup> A balanced and optimal engagement of both processes is significant in critical care and in end-of-life scenarios where the need for optimal synthesis is critical. Formulating students' decision-making processes is the ultimate skill to be acquired by new graduates, although analytical reasoning cannot be taught directly when addressing complex patient care.<sup>[2,8]</sup> An optimal decision-making process involving type I (rational) and type II (intuitive) processes is critical in multifaceted healthcare scenarios pre-

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senting formidable challenges to healthcare professionals. Therefore, process acquisition of type I and type II thinking to solve complex clinical scenarios can signal professional maturity. There is a gap in knowledge in the description of this process in undergraduate nursing students' education.

A quantitative study may not be sufficient considering the complexity and ambiguity of critical care scenarios and may require mixed methods. Application of intuition may improve the effectiveness of the decision-making process as it is the foundation of type II process.<sup>[2,8]</sup> However, the intuition process is difficult to study, which leads to discounting intuition as part of clinical decision making. Balanced application of both processes may vary depending on past experiences, cultural beliefs, or values of the undergraduate nursing students.<sup>[2]</sup> Despite not taught in nursing curriculums, experienced nurses reported overwhelming intuition use in clinical practice as illustrated in the seminal novice to expert work of Benner.<sup>[2]</sup>

Taylor and colleagues<sup>[9]</sup> used semi-structured interviews with 19 nurses and physicians caring for dying patients to describe the support of the use of intuition and expertise in the clinical decision-making process. These two components have positive and negative aspects when recognizing the time constraints in decision making for the dying patient. The Dual Process Theory for decision making has System 1 decision-making which involves intuition and is automatic, quick, and emotional and the decision is done subconsciously whereas, System 2 decision-making is more deliberate, and slower while considering multiple options to make a conscious decision.<sup>[10]</sup> As expected from the Dual Process Theory, practitioners used both rational and intuitive decision making to recognize the dying individual.<sup>[9]</sup> This was also demonstrated during simulation and case studies of complex illnesses.<sup>[11,12]</sup> In contrast, pre-licensure nurses used intuition sparsely.<sup>[11,12]</sup> Implications can be far reaching in nursing education for educators to enhance learning using intuition in combination with analytical processes as the mark of professional maturity.

Application of type II thinking and intuition requires a departure from rational thinking. Using intuition may be uncomfortable as the trainee must depart from the logical style of thinking, venture into unfamiliar alternative way of thinking, and tolerate ambiguity.<sup>[13]</sup> Therefore, tolerance of ambiguity (TOA) and risk-taking behaviors (RTB) may be utilized in the deployment of type II thinking, especially during learning how to optimally engage this kind of thinking.<sup>[10]</sup> Intolerance of ambiguity is the perception of a threat during uncertain situations.<sup>[13]</sup> Low TOA results in "covering bases" behavior, such as excessive test ordering requiring increased spend-

ing.<sup>[14-16]</sup> The dual edge nature of TOA is demonstrated by failure to demonstrate the association of uncertainty and increased utilization of treatment, warranting further investigation in this area.<sup>[14,17]</sup> Risk aversion behavior among health care professionals leads to increase in healthcare cost and utilization due to the fear of making errors.<sup>[18,19]</sup> On the other hand, high levels of risk seeking behaviors among students is hypothesized to lead to approving the continuation of supportive care therapy options.<sup>[20,21]</sup> Given the impact of RTB on decision outcomes, it is important to understand the pivotal role of TOA and RTB among nursing students and emergence of intuitive thinking.<sup>[13]</sup>

The aim of this study is to examine clinical decision-making in sophomore, junior, and senior undergraduate nursing students in end-of-life care situations to examine the relationship between clinical decision making, RTB and TOA. Using Dual Process Theory, the acquisition of type I and type II thinking among students was assessed.<sup>[22]</sup> We examined the relationship of clinical decision-making, RTB and TOA utilizing clinical vignettes pertaining to complex end of life situations. We hypothesized that senior undergraduate students would exhibit higher TOA and more frequent application of RTB as pre-requisites to the emergence of type II/clinical decision making. Concomitantly, we made two following assumptions 1) Increase in RTB score will be positively associated with intuitive decision-making style and negatively associated with the rational decision-making style. 2) The increase in TOA score will be positively associated with rational decision-making style and negatively associated with intuitive decision-making style. On the operational level, intuitive decision making should be associated with less support for aggressive therapies and more support for continuation support care in certain end of life scenarios.

## 2. METHODS

This was a cross-sectional descriptive and correlational research study.

### 2.1 Setting/sample

Data collection took place at two large educational universities in the Northeast region of the US. The secure web application, REDCap (Research Electronic Data Capture) was utilized for the online database and surveys.<sup>[23]</sup>

### 2.2 Study groups

After securing the permission of the lecturers, electronic links to the survey were emailed to students prior to class time. After consenting to participate, a student gained access to the survey. Students were informed that participation, or lack of thereof, had no relevance to any penalty or academic

reward.

The study was approved by the Institutional Review Board at the University of Pennsylvania.

**2.3 Study procedure**

The participants in this study completed: a demographic questionnaire (see Table 1), Decision Style Scale (DSS),<sup>[24]</sup> TOA,<sup>[25]</sup> and RTB Scale.<sup>[16]</sup> Participants were also given four clinical vignettes to determine their choice of care options in complex care scenarios. The DSS is a 10-item questionnaire measuring participants’ rational (logical or type 2 thinking)

and intuitive reasoning dimension (5 questions for each dimension).<sup>[24]</sup> The higher mean score in the rational or intuitive reasoning dimension delineates a tendency to support care options based on that decision making dimension. The scale demonstrated high internal consistency and reliability measures. The test-retest reliability for the intuitive and rational was high with  $r = 0.79, p < .01$ . This tool demonstrated proper discriminant and convergent validity across the studied five independent samples and correlated with the decision-making individual differences and International Personality Item Pool (IPIP) Big Five Traits.<sup>[24]</sup>

**Table 1.** Clinical vignettes and questions

Vignette 1: A 70-year-old woman fell down the stairs and was admitted to the intensive care unit. She has been there for two weeks. She sustained a brain injury and has been unconscious since the accident. She requires the ventilator machine to support her lung function and she requires a dialysis machine to support her kidneys. There has been minimal progress on trying to wean her from these machines. She is able to withdraw to pain but otherwise is unconscious and unable to interact with family or staff. Her family chooses to proceed with surgery to place a long-term feeding tube and a tracheostomy tube. After those procedures, she would be transferred to a long-term care facility.			
Vignette 2: Your patient was diagnosed with colon cancer five years ago and have undergone resection. The cancer was in remission (cancer free), but now has returned with metastatic disease to the liver, lungs, and brain. He was admitted to the hospital with shortness of breath and has been receiving treatment for pneumonia. The admission status is full code. During admission, the patient developed a brain bleed and is now unable to move the right leg and is unable to speak. He also developed a bed sore and sepsis (a blood stream infection that can cause multiorgan failure). The code status remained unchanged, "full code," and continued with treatment/hospitalization.			
Vignette 3: Your patient is a 67-year-old and was diagnosed with malignant brain cancer with metastasis to the liver and lungs. Your patient was admitted to the hospital with shortness of breath and treated for pneumonia. The admission status is full code. During admission the patient develops a brain bleed and is now unable to move the right leg and unable to speak. The patient now developed a bed sore and sepsis (a blood stream infection that can cause multiorgan failure). The code status remained "full code" the same and the patient proceeded with treatment/hospitalization.			
Vignette 4: Your patient is a 75-year-old and has been in a motor vehicle accident and has been in the intensive care unit for two weeks. Your patient has injured the brain and has been unconscious since the time of the accident. The patient now requires the ventilator machine to support the lung function and a dialysis machine to support the kidneys. There has been minimal progress on trying to wean from these machines. The team chose to proceed with a surgery to place a long-term feeding tube and a tracheostomy tube. After those procedures the patient would be transferred to a long-term care facility.			
Questions 1,2,3 and 4 for all Vignettes			
Please indicate your support for this decision	Did you have enough information to answer the previous question?	How frequently have you experienced this situation in clinical?	How frequently have you experienced this situation personally?

Tolerance of Ambiguity (TOA) was measured utilizing the revised 16-item true/false questions.<sup>[25]</sup> This tool demonstrated a high reliability measure with Cronbach  $\alpha r = 0.71$ . A high score indicates higher TOA.<sup>[25]</sup> According to the key, questions were scored 0 if marked false or 1 if marked true. Scores were then added for a total score. Higher scores represent higher TOA.

Risk-taking behavior (RTB) was measured using the adapted RTB subscale<sup>[16]</sup> of the Jackson Personality Inventory (JPI).<sup>[16]</sup> This risk tool is composed of 6 questions graded on

a 6-point Likert scale with an internal reliability of 0.7. The sum of the scores was the total. Higher scores represented higher RTB.

**2.4 Clinical vignettes**

Participants read four clinical vignettes and answered questions describing their preparation for the scenario and their support of the presented care option (see Table 1). To remove the stress of clinical decision-making in live clinical situations, clinical vignettes were written in lay terms since the original intent of the project was to evaluate decision-

making styles in participants with all levels of experience, from students to practicing physicians. These vignettes are similar to clinical cases and were chosen and re-written to be vague and do not reflect standards of care at the time of the study. This decreases the stress inherent in complex medical scenarios. The vignettes were reviewed by an ad hoc interview with nurses in an intensive care unit in terms of their readability and understanding. They were not designed for medical accuracy and detail but rather reflect situations with patients who require complex and ethical care common in intensive care units.

**2.5 Statistical analysis**

Descriptive statistics were used to analyze demographic data. Inferential statistics were used to test the hypotheses. Specifically, a Kruskal Wallis H test was run to determine if there were differences in decision-making style and education level. Spearman’s rank-order correlations were utilized to assess the relationship between TOA and decision-making style as RTB Scale had incomplete data (incomplete answers or no answers at all). Thus, this variable was excluded from statistical analysis. Of note, those who completed the survey (n = 4) answered uniformly “extremely agree” or “extremely disagree”. The data were analyzed as independent, samples. A one-sided p-value less than .05 was considered statistically significant for all tests. Statistical analyses were performed with IBM® SPSS® Statistics 28.0 (Armonk, NY).

**3. RESULTS**

**3.1 Characteristics of the sample**

Demographics of the study participants are presented in Table 2. The mean grade point average was 3.45 (2.8-4.00) on a 4-point scale.

**Table 2.** Sample demographics (n = 377)

		N (%)
Gender	Male	39 (10.3)
	Female	338 (89.7)
Race/Ethnicity	Asian/Pacific Islander	23 (6.1)
	Black	21(5.6)
	Latino	15(4.0)
	Other	8 (2.1)
	White	310 (82.2)
Year of Enrollment (Level of education)	Sophomore	80 (21.2)
	Junior	157 (41.64)
	Senior	140 (37.1)

**3.2 Decision-making style and tolerance of ambiguity**

Intuitive and rational decision-making style scores were similar in all participants (2.41 ± 0.71 vs 2.33 ± 1.047\*\*). Among students mean scores for rational decision-making

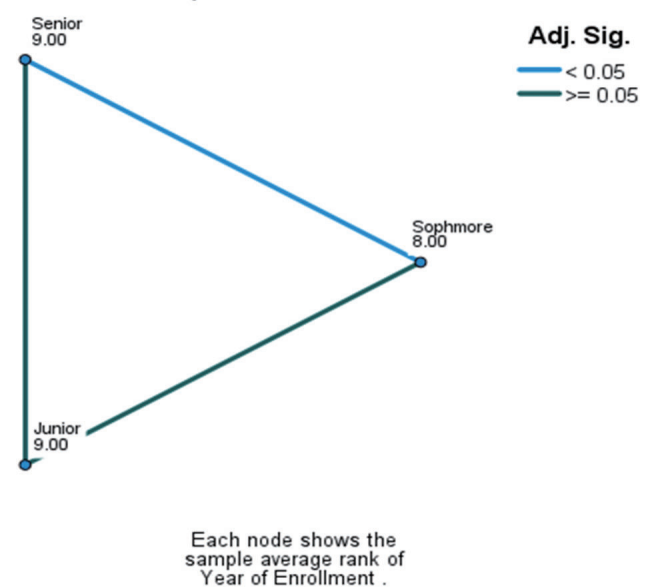
style ranged from 2.225-2.438 with sophomores having the highest mean score (2.438, SD = 1.07) compared to junior students (2.225, SD = 1.02) and senior students (2.393, SD = 1.05). The distribution of the intuitive and rational scores demonstrated that seniors tended to use more rational decision making although not statistically significant (see Table 3, Figure 1).

**Table 3.** Descriptive statistics across year of enrollment: DSS and TOA

Year of Enrollment (N)	Intuition DSS Median X (SD)	Rational DSS Median X (SD)	TOA Median X (SD)
Sophomore (79)	2.24, 2.49 (0.655)	2.2, 2.44 (1.074)	8.0, 8.30 (2.559)
Junior (158)	2.4, 2.38(0.718)	2.0, 2.23 (1.023)	9.0, 8.72 (2.699)
Senior (140)	2.4, 2.39 (0.735)	2.2, 2.39 (1.054)	9.0, 9.00 (2.515)*
Mean Overall	2.4, 2.41 (0.711)	2.2, 2.33 (1.047)	9.0, 8.74 (2.608)

\*Statistically significant when compared to sophomore students when comparing the TOA across years of enrollment (sophomore, junior or senior students), the difference in score value between sophomore and senior students was statistically significant (t = 10.12, p = .001).

**Pairwise Comparisons of Year of Enrollment**



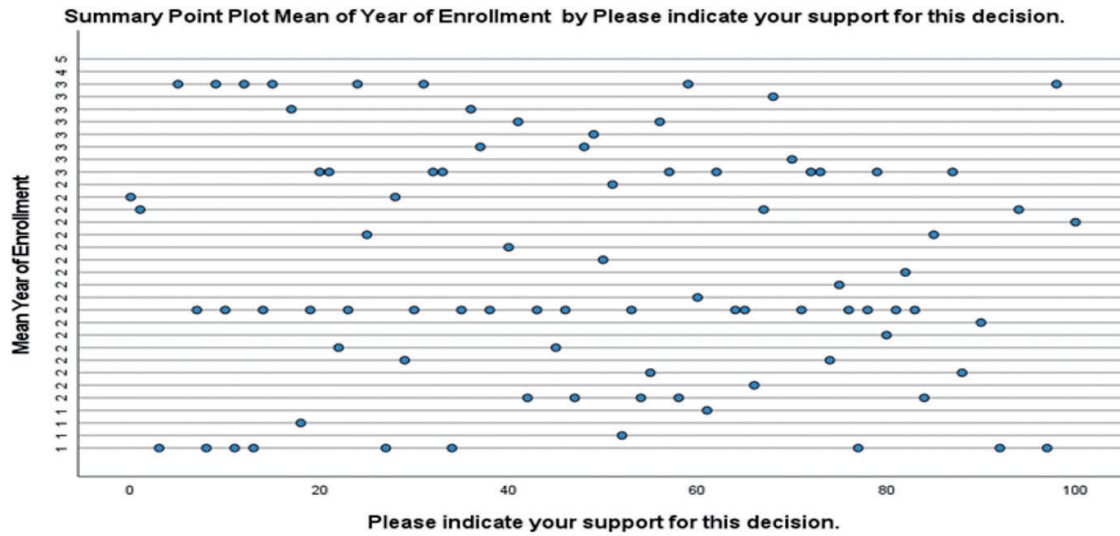
**Figure 1.** Relationship between levels of education

**3.3 Clinical vignettes**

In general, there was a support for aggressive therapy (tracheostomy for long-term mechanical ventilation, artificial nutrition) in all vignettes as demonstrated by score variance (see Figure 2). Seniors did not support medical care decisions of continuing aggressive care or providing comfort care in any of the vignettes (mean = 41.89-47.91). Furthermore,

participants felt they had enough information in all vignettes to make this decision in vignette 2 and 3 (mean score 50.85 and 52.06). When comparing levels of enrollment, both juniors and seniors felt they had enough information in vignette 2 (mean = 52.41 and 51.81) and vignette 3 (mean = 51.37 and 54.34) respectively. The study participants viewed

themselves as having no or little clinical or personal experience with complex critical care situations. When analyzing by year of enrollment, seniors tended to have more experience with complex care situations both personally (mean = 22.17-27.58) and clinically (mean = 26.68-29.97) than other students (see Table 4).



**Figure 2.** An example of variance in support for aggressive therapy from Vignette 1  
 Legend: 1 is sophomore year; 2 is junior year and 3 is senior year of enrollment

**Table 4.** Clinical Vignettes Descriptive

Year of Enrollment	Vignette#1: mean (SD)	Vignette#2; mean (SD)	Vignette#3; mean (SD)	Vignette#4; mean (SD)
Sophomore (79)	52.65 (24.00)	50.72 (27.322)	53.62 (23.617)	50.73 (27.047)
Junior (158)	45.96 (21.861)	54.82 (24.618)	54.94 (23.833)	45.22 (21.329)
Senior (140)	41.89 (24.041)	46.44 (27.322)	47.91 (23.617)	42.11 (27.047)
Overall (377)	45.96 (23.255)	54.82 (26.969)	54.94 (25.087)	45.22 (23.599)
Did you have enough information				
Sophomore (79)	39.03 (27.867)	49.46 (29.734)	49.10 (26.215)	46.43 (28.587)
Junior (158)	45.92 (28.065)	52.41 (27.871)	51.37 (28.02)	50.92 (25.028)
Senior (140)	47.54 (23.595)	51.81 (28.784)	54.34 (26.828)	47.93 (23.562)
Overall (377)	45.85 (29.204)	50.85 (30.020)	52.06 (29.038)	45.22 (28.017)
How often have you experienced this in clinical practice				
Sophomore (79)	7.47 (15.603)	7.87 (16.255)	6.91 (15.566)	7.76 (18.253)
Junior (158)	9.87 (20.687)	8.25 (18.929)	7.76 (17.1)	8.42 (17.891)
Senior (140)	28.48(29.240)	29.97 (30.199)	28.25 (28.662)	26.68 (27.881)
Overall (377)	16.28 (25.195)	16.24 (25.58)	15.19 (24.024)	15.08 (23.877)
How often have you experienced this personally				
Sophomore (79)	16.30 (24.746)	10.70 (18.916)	7.75 (17.521)	10.61 (20.562)
Junior (158)	18.89 (26.750)	9.48 (18.092)	8.91 (18.034)	10.40 (20.696)
Senior (140)	27.58 (31.785)	23.11(29.298)	22.55(28.491)	22.17(28.861)
Overall (377)	21.58(28.663)	14.80(23.863)	13.71 (23.363)	14.81(24.637)

### 3.4 Clinical decision making and treatment strategies

Distributions of intuition and rational decision-making scores were similar for all groups. Intuition is measured on the decision-making style tool. Median rational decision-making style scores were similar in sophomore and senior students (2.2) and slightly lower (2.0) among junior students, but the differences were not statistically significant. The relationship between intuitive decision-making style and the support for continuation of care was in general weak ( $r_s = -0.067-0.119$ ) except for vignette #1 ( $r_s = 0.119, p = .021$ ). No statistically significant correlation between rational decision-making style and support of treatment strategy decision was found in any of the vignettes ( $r_s = -0.069-0.052$ ) (see Table 4).

A negative correlation between intuitive decision-making and TOA ( $r_s = -0.031, p = .547$ ) was demonstrated. There was also a negative but small correlation between rational decision making and TOA ( $r_s = -0.040, p = .441$ ). There was a small negative correlation between year of enrollment and support of decision in vignette 1 ( $-0.167, p = .001$ ) and stronger correlation between year of enrollment and clinical experience in vignettes 1 -4 ( $0.34-0.329, p = .001$ ). There was a small correlation between intuitive decision making and support for decision in vignette 1 ( $0.148, p = .004$ ) and IDSS and personal experience in vignetter 4 ( $0.106, p = .039$ ). See Table 5 for more details.

**Table 5.** Correlations between Year of Enrollment, TOA, IDSS, RDSS and Vignettes

	Vig 1 Q 1: support decision (correlation p)	Q2 Enough information	Q3: Clinical experience	Q4: personal experience	Vig 2 q1	Q2 Enough information	Q3Clinical Experience	Q4 Personal experience	Vig3 q3 Clinical experience	Q4: personal experience	v4q1, Support decision	Q3 clinical experience	q4 Personal experience
YOE	-.167 ( $p = 0.001$ )	0.100 $p = 0.051$	.34 $p < .001$	.156 $p = .002$	-0.080 $p = .120$	0.024 $p = .643$	0.36 $p < .001$	.222 $p < .001$	.368 $p < .001$	.261 $p < .001$	-.132 $p = .011$	0.329 $p = .001$	.0197 $p < .001$
TOA	-0.081 $p = .116$	.111. $p = .032$	0.058 $p = .265$	.034 $p = .612$	-0.031 $p = .546$	-0.003 $p = .957$	0.087 $p = 0.093$	-0.023 $p = .651$	0.013 $p = .765$	0.014 $p = .785$	-0.050 $p = .337$	.100 $p = .053$	0.077 $p = .134$
IDSS	.148 $p = .004$	.071 $p = .171$	-.022 $p = .67$	0.049 $p = .343$	.000 $p = .100$	.088 $p = .0086$	0.033 $p = .529$	0.031 $p = .554$	0.045 $p = .382$	0.056 $p = .275$	0.061 $p = .24$	0.052 $p = .371$	0.106 $p = .039$
RDSS	0.086 $p = .095$	-.030 $p = .563$	0.031 $p = .543$	0.050 $p = .337$	-0.024 $p = .643$	.008 $p = .873$	0.028 $p = .585$	0.051 $p = .328$	0.044 $p = .397$	0.033 $p = .522$	.002 $p = .97$	.088 $p = .088$	0.084 $p = .105$

Note. YOE = year of enrollment; TOA = tolerance of ambiguity; IDSS = intuitive decision-making style; RDSS=rational decision-making style;  $p$  = level of significance; highlighted cells represent statistically significant.

## 4. DISCUSSION

The purpose of this study was to explore the decision-making styles of undergraduate nursing students when faced with end-of-life clinical situations and to determine if TOA and RTB influenced decision-making. We demonstrated a negative correlation between decision making style and TOA. We found no difference across the group of enrollments in terms of engaging in different decision-making style. However, sophomore students reported higher TOA score as compared to junior students.

In general students supported aggressive care across all cases regardless of their decision-making style. Continuation of supportive care had significantly less support. This may demonstrate a lack of knowledge among the students, or the vignettes were possibly written in a polarizing manner. Additionally, the students may have felt they were “giving up” if opting for supportive care.

This is like prior data where participants lacked exposure and training regarding end-of-life care in undergraduate curriculum and segues to new graduates being ill-prepared to participate in end-of life decision-making situations.<sup>[26]</sup> Perhaps the high number of junior students skewed the data in the study as the support for continuation support care was observed in greater frequency in sophomore students, a less experienced individual. Interestingly, in all vignettes and

all education levels the participants showed that they have enough information to support the treatment plan.

Decision making styles were not different across the education stages. However, TOA was higher in sophomores. Also, TOA was higher in senior students who tended to support aggressive treatment except when presented with aggressive treatment options. Our study adds to the prior body of literature.<sup>[27-30]</sup> Higher expression of TOA may represent the initial step when students become acquainted in complexity of the care and related ambiguity in clinical situations. Also, the period of three years of education may not be sufficient for change in personal traits such as TOA.

Contrary to our hypothesis, tolerance of ambiguity was not found to be statistically significant in this study (see Table 3). We presume that clinical experience influences TOA which changes over time, and perhaps changes in level of education. Dimensions of TOA include novelty (coping with new situations), complexity (uses multiple sources of information) and insolubility (difficult problems to solve).<sup>[31]</sup> These different dimensions may explain the results of this study and were not examined here. The novelty of using clinical vignettes could have been overwhelming and did not allow for any differences of the responses. Also, the lack of the differences in student responses may be influenced by their prior ideals, moral values, and experiences. This may re-

sult in a somewhat stochastic process which has not been organized or influenced by formal education or professional experiences. End of life care is complex and difficult to study using vignettes.

**Decision-making style:** There was no statistically significant correlation with rational decision-making style and the support of treatment strategies. Alternatively, intuition decision making styles had a weak negative correlation supporting the use of continuation of supportive care in vignette 1 meaning the participants supported the use of supportive care. In addition, vignette 4 had a positive correlation between personal experience with end-of-life care and the use of continuation of supportive care. Recommendations for the continuation of supportive care were suggested in the way vignettes 1 and 4 were written. Benner has found that experience and intuition influence differences in decision making style.<sup>[1]</sup> Our participants had little exposure to or experience with the situations related to end-of-life care as portrayed in the clinical vignettes. Clinical decision making, RTB, and TOA are worthy of further investigation. Further, few participants felt they had enough information to decide whether they supported the medical treatment in the vignettes limiting the influence of CDM, but this remains unknown.

In an integrative review by Nibbelink and colleagues, levels of experience with scenarios made a difference compared to decision-making style, however experience may also complicate decision-making.<sup>[32]</sup> Clinical decision-making is a complex concept. In fact, intuition biased the participants in their integrative review.<sup>[32]</sup> The difference between our study and these authors might be because it was an integrative review and not a clinical study. In our study, the participants had little experience with end-of-life situations so we cannot make this conclusion. It is unknown why or how this lack of experience in our participants influenced their clinical decision making in the vignettes. However, there were small statistically significant correlations between year of enrollment and clinical and personal experience with the scenarios. There was also a small but statistically significant correlation between IDSS and personal experience in vignette 4. Context may influence decision-making in nursing practice as well as levels of experience.<sup>[8]</sup>

#### 4.1 Limitations and strengths

There are several limitations and strengths to this study. First, the risk-taking behavior survey was not completed by every participant. Therefore, we could not analyze and answer one of the hypotheses. Second, only one age group was included. This may or may not have impacted the results of this study. Only traditional students aged 18-29 years and no

second-degree students were included. It might be beneficial to include other age groups and second-degree students who may have additional personal life experience with end-of-life scenarios or continuation support care. This raises the question of whether age or experience would influence the support of medical decisions made in the vignettes.

Additionally, there were fewer sophomores than juniors and seniors and it is unclear how this impacted the results of this study or the decision-making style of the participants. There was no statistically significant difference in year of enrollment and decision-making styles. It is unknown whether year of enrollment is a surrogate for age.

There was also no clear definition or clear terminology of continuation support care provided in the study. A visual analog scale was used in the clinical vignettes. Further, we did not study cultural preferences, morals, or ethics and whether they would be influential in the support of treatment strategies. We were also unable to review nursing curriculum content and it is unknown if this impacted the results of this study but may be important. This paired with a lack of clear definition of continuation support care in the study may be influential to our results. These topics require further exploration.

**Strengths:** Two universities were used providing a large sample size. Validated tools were used providing strength to the study. Additionally, the tools that were completed were answered in entirety so there was no missing data. The research team was multidisciplinary in nature, further strengthening the interpretation of the results.

#### 4.2 Suggestions for the future

Exposure and education regarding end-of-life care may be important but has not been studied well in undergraduate students. This could be accomplished through planned didactic lectures and simulation experiences as well as in the clinical arena should the scenario occur. Providing education of end-of-life care has been shown to be efficacious but warrants further study. Additionally, other studies on the effect of ambiguity in decision-making should be undertaken.

Older students and second-degree students should be included in future studies to determine if life experience influences the support (or lack thereof) of continuing aggressive care regardless of the clinical scenario. Further studies should include cultural influence, morals and ethics and their impact on the use of continuation support care or decision-making style in end-of-life scenarios and the use of continuation support care.

## 5. CONCLUSION

The lack of experience and/or curriculum content with end-of-life scenarios in undergraduate students is sorely lacking and necessitates further consideration. This lack of experience may also add to the difficulty in decision making and should be studied in more detail in the future. Furthermore, additional studies with second-degree students to determine if personal life experiences impact decision-making style in end-of life-scenarios are warranted.

Conclusions regarding RTB were unable to be made in this study due to the substantial lack of data. The reason for why this questionnaire was incomplete is unknown. Interestingly, for those who completed this survey, only two responses were chosen: strongly agree and strongly disagree. Relationships between intuitive or rational DSS, year of enrollment and TOA in end-of-life scenarios had minimal statistical significance. Although in this study clinical significance is inconclusive, other investigators have determined that new graduate nurses have difficulty in end-of-life scenarios. Intuitive decision-making styles are important in nursing care yet remain difficult to study. Additional research including education or revision of curriculum utilizing end-of-life scenarios may shed light on undergraduate student decision-making styles.

## ACKNOWLEDGEMENTS

Not applicable.

## AUTHORS CONTRIBUTIONS

Not applicable.

## FUNDING

This research received no external funding.

## CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

## INFORMED CONSENT

Obtained.

## ETHICS APPROVAL

The Publication Ethics Committee of the Sciedu Press. The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

## PROVENANCE AND PEER REVIEW

Not commissioned; externally double-blind peer reviewed.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

## DATA SHARING STATEMENT

No additional data are available.

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