

# Tools for Assessing Professional Identity in Health Profession Education: A Scoping Review

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## Research Article

**Keywords:** Tools, Assessing, Professional Identity, Health Profession Education, Scoping Review

**Posted Date:** November 28th, 2022

**DOI:** <https://doi.org/10.21203/rs.3.rs-2269507/v1>

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## Abstract

## Background

Learning about the formation and development of professional identity and its principled planning in universities play an essential role in the development of the identity of individuals in educational and professional environments. Although the formation and development of identity is the main goal of Health Profession Education, due to the complexity of this process and its multidimensional nature, appropriate measurement and evaluation criteria are not readily available. To address this gap, a scoping review was conducted to explore current knowledge in assessing professional identity and map directions for future research.

## Methods

The present scoping review was conducted based on the five-step framework of Arksey and O'Malley. At first, the research question was formulated. Then, PubMed, Eric, ProQuest, Scopus databases and Google scholar search engine were systematically searched until September 2022. The two authors independently selected all articles based on screening eligibility criteria and charted the data. Finally, the eligible articles were analyzed using descriptive analysis of studies on the characteristics and psychometrics of the tools and their underlying theories.

## Results

After extensive searching 9,924 studies were identified. 162 studies were selected for full-text review of which 17 articles were eligible to be included. More than half of the articles were from England and Japan. Most of the target group was studies on nursing and medical students. In 14 studies included, tools and psychometric properties were mentioned. Several theories were used to develop professional identity assessment tools. Identity theories were the basis for designing or developing most tools. In identity theories, social identity theory and Kagan's constructive-developmental theory were used more than others.

## Conclusions

The results of this scoping review will help researchers to choose or develop reliable and valid tools in accordance with clear conceptual and theoretical frameworks to measure and evaluate the formation and development of professional identity in Health Profession Education. Developing comprehensive tools that underpin the appropriate conceptual framework provides the possibility of evaluating the continuous and nonlinear process of the formation and development of professional identity which can be implemented at a large scale.

## Background

Training efficient graduates to meet the health needs of the 21st century will not be possible without the growth and improvement of all functional aspects and professional development. In this regard, special notice was taken of the formation and development of professional identity along with increasing the complexity of health care needs and patients' expectations in recent years and the attention paid to the necessary qualifications by health students. Professional identity is essential for safe and effective practice in all allied health professions [1].

The available evidence suggests that today's students who graduate from universities do not have the appropriate professional development to succeed in the future workplace [2–4]. Therefore, understanding how to form and develop professional identity and to plan the principles in line with it in universities, will play a major role in the development and formation of individual identity from studying at university to the professional life of health professionals [1, 5].

Acquiring professional identity has been known for centuries as a fundamental element of the mission of medical education. In the past, it was referred to by words such as "character" or having appropriate "characteristics" [5, 6]. Instead of merely achieving the qualifications of a profession and emphasizing on doing things, the professional identity formation focuses on strengthening the ability to think, act and feel like a professional. This process is further defined as a continuous and self-directed process with the goal of developing the growth of "thoughts, actions, and feelings in an individual" during which the essential characteristics, values, and norms are internalized [7–11]. The professional identity formation will allow students to have the capacity to cope with the growing complex problems in healthcare environments [12, 13]. An internalized, self-defined professional identity will help students perform effectively in rapidly evolving environments [14].

The importance of the professional identity formation increased with the 2010 report of Carnegie Foundation [8, 15]. The Carnegie Foundation for the Advancement of Teaching considered the professional identity formation the main goal of medical education [7, 16–19]. Also, this foundation considers it important to facilitate the professional identity formation in learners by faculty members and planning for its promotion and growth during the educational period [7]. Scanlon (2011) introduced the process of "becoming professional" instead of "being professional", which reaffirms the role of educational programs in providing the areas of professional development of learners during their academic studying [20]. In this regard,

the focus is on “becoming professional” instead of doing professional work [8, 21–23]. Accordingly, Cruess stated in 2016 proposed that the “Is” level should be above the “Does” level in Miller’s pyramid. This has thus confirmed Hafferty’s statements on the principled assessment of professional identity and assessing what one “is” and not what one is “doing” [16, 21].

Subsequently, specialists such as Cruess (2014 and 2019), Selinger-Jarvis (2012), Holden (2015), Kalet (2018) expressed support for the professional identity formation for each medical student, including undergraduate medical education and residency, and considered it to be the primary goal of medical education. They also emphasized the change of training strategies and assessment to support this goal [5, 7, 8, 23–26]. Apart from emphasis on professional identity and its formation in medical students [8, 23, 27], professional identity formation has been discussed as an essential issue in other areas of medical sciences such as pharmacy [28–31], nursing [32–35], dentistry[36] with the aim of supporting the development of professional identity.

Although the formation and development of professional identity is the main goal of Health Profession Education, but due to the complexity of the process of the professional identity formation and its multi-dimensional nature, experimental data on the assessment of how it forms and develops are limited [37]. Moreover, although several qualitative studies have been conducted through open-ended interviews to assess professional identity [9], identifying valid and reliable tools in which the complexities of the mentioned process are considered can provide ways to better research and understand the development and professional identity formation; tools that in addition to being able to perform the assessment of professional identity formation in larger scale as educational or research purposes, facilitate comparison of the development and professional identity formation among various paradigms and nationalities [38, 39]. Reviewing the literature did not show any review studies aimed at identifying reliable and valid tools to assess the formation and development of professional identity in Health Profession Education. Therefore, the aim of current scoping review is to create a cumulative map of related literature for identifying reliable and valid tools based on appropriate theories and to help determine knowledge gaps available in the field of measurement and assessment of formation and development of professional identity in Health Profession Education.

## Method

### Research Questions

This scoping review was performed based on the five-step Arksey and O’Malley framework [40] which included: (a) Identifying the research question; (b) Identifying relevant studies; (c) Study selection; (d) Charting the data; and (e) Collating, summarising and reporting the results. The review is reported in concordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) [41].

#### (a) Identifying the research question

Our review questions include:

1. What tools have been developed to assess the formation and development of professional identity in health profession education so far?
2. Are the tools developed to assess the formation and development of professional identity for health profession education, reliable and valid?
3. Do the tools developed to assess the formation and development of professional identity for health profession education have the required theoretical basis?

#### (b) Identifying relevant studies

##### Selecting databases

A systematic search to identify evidence related to research questions in electronic databases like PubMed, Eric, ProQuest, Scopus and Google scholar search engine was performed. The search was conducted on February 16, 2018, and the search was re-run on September 21, 2022.

##### Search strategy

A three-person task force was formed for systematic analysis. The researchers came together at all stages of the study to discuss any challenges or uncertainties related to the selection of studies and to revise their search strategy if needed. At first, the search strategy was written broadly so that the studies related to the research question can be selected and included in the study by considering the inclusion and exclusion criteria. Initially, the search strategy employed the search phrase “professional identity”, “professional identity formation” and “professional identity development”. Since all the terms contained the phrase “professional identity”, the search strategy only used this phrase along with applicable inclusion and exclusion criteria to the database. The following are respectively sample searches in PubMed and ProQuest:

##### PubMed:

Advanced search (“Professional identity”[Title/Abstract]) = 2594 = Limited by English = 2430

##### ProQuest:

## Inclusion and exclusion criteria

Considering the limitations, the study period was from the beginning to September 21, 2022. The inclusion and exclusion criteria are shown in Table 1.

Table 1  
Study eligibility criteria

<b>Inclusion criteria</b>	<p>The following articles were included:</p> <ol style="list-style-type: none"> <li>1. Published in English</li> <li>2. Focuses on health profession education</li> <li>3. Articles with quantitative or qualitative method</li> <li>4. Original articles, review articles, dissertations</li> <li>5. Tools for assessing professional identity/professional identity development/professional identity formation</li> <li>6. Publications date to September 21, 2022</li> </ol>
<b>Exclusion criteria</b>	<p>The following articles were excluded:</p> <ol style="list-style-type: none"> <li>1. Non-English articles</li> <li>2. Focuses on other population outside the health profession education</li> <li>3. Articles outside of assessing professional identity</li> <li>4. Those without full text following contact of the corresponding author</li> <li>5. Books, books chapters, conference papers, conference abstracts</li> </ol>

### (c) Study selection

In the first step, databases with high sensitivity were evaluated based on search strategy and then the retrieved articles were entered in EndNote software. Then, the paper was examined to remove duplicate records. Both authors (ZST and MKM) studied all topics and abstracts of the retrieved articles and extracted the related ones by considering the criteria of study inclusion and exclusion. A thorough review of the text entries was carried out by the two authors independently. The third author's (HA) opinion was taken into consideration when there was a dispute between the authors to reach consensus. Then the retrospective and prospective search was performed in the form of ancestry searching (in the list of references to included studies) and forward tracing (in the citations of included studies) in Google scholar. The authors of the relevant studies were also contacted for any additional information or full text version of their works when needed.

### (d) Charting the data

A preliminary data extraction form was created to draw data from all studies, interpretations, and repeated reviews. The authors discussed what data is necessary to answer the study question. ZST and MKM reviewed all 17 articles and the data of all studies were examined. To minimize bias, the first two authors independently reviewed each article. Differences in the extracted data were compared and discussed by the first two authors and resolved by the third author (HA), if necessary. The quality of the studies was not evaluated with respect to the scoping review methodology.

### (e) Collating, summarising and reporting the results

The present scoping review data were collected and summarize in a two-step process. In the first stage, the key features of the included studies were analyzed according to Table 2 by ZST and MKM. Then, descriptive analysis was carried out in Tables 3 and 4.

## Results

### Mapping The Results

In the preliminary sources and texts search, 9924 studies were identified. Then, after removing the redundant studies and studies that did not conform to the exclusion criteria (Table 1), the texts of 162 articles were selected to be fully examined (Fig. 1). The full-text articles were done by ZST and MKM and the agreement was 97% (157/162). The third author (HA) was also interested in creating a consensus among the authors.

Fifteen articles met the eligibility criteria following full-text review (Fig. 1). Finally, the second generation of search was performed in Google scholar by ancestry searching and forward tracing. After finding two more new studies, a total number of 17 studies were selected based on inclusion and exclusion criteria. A flowchart of the search and selection process, reported in line with PRISMA guidelines, is provided (Fig. 1) [42].

## Study Characteristics

The key features of the included studies according to Table 2 included author, year of study, title of journal, country, being or not being theory-driven, type of tools used in the study (Table 2).

Seventeen studies providing tools were found, of which 4 (about 23.53%) were not theory-driven. The years of publication varied from 1986 to 2022. Most of the included studies were from England (5 studies), Japan (4 studies), the USA and Australia (2 studies for each). Other studies were from China, the Netherlands, Saudi Arabia, and Thailand (each one). The methodology of the included studies was comprised of six mixed methods (quantitative and qualitative), six quantitative studies, four survey studies, and one review study. Studies were also based on different theories.

Table 2

Key characteristics of articles included in this scoping review on Health Profession Education Tools for Assessing Professional Identity

No.	Authors	Year	Journal name	Country	Theory	Tool
1	Brown & et al.	1986	Journal of Occupational Psychology	UK	<ul style="list-style-type: none"> <li>• Realistic Conflict Theory</li> <li>• Social Identity Theory</li> </ul>	Professional Identity Questionnaire (PIQ) [44]
2	Cowin, L.	2001	West J Nurs Res	Australia	Self-concept Theory	Nurse Self Concept Questionnaire (NSCQ) [45]
3	Madill, A.	2005	Social Science & Medicine	UK	Personal Construct Theory (George Kelly 1955)	Repertory Grids [46]
4	Adams K. & et al.	2006	Learning in Health and Social Care	UK	Social Identity Theory (Henri Tajfel 1970)	Macleod Clark Professional Identity Scale MCPIS [47]
5	Crossley J. & Vivekananda-Schmidt P.	2009	Medical Teacher	UK	Not stated	Professional Self Identity Questionnaire (PSIQ) [48]
6	Hao Y. F.	2014	Master Thesis	China	<ul style="list-style-type: none"> <li>• Symbolic Interactionism</li> <li>• Erikson's Psycho-social Development Theory (Ohlen' Theory Framework of Profession Identity)</li> </ul>	Professional Identity Scale for Nursing Students (PISNS) [49]
7	Goltz H.H. & Smith M.L.	2014	Health Promotion Practice	USA	<ul style="list-style-type: none"> <li>• Social Identity Theory</li> <li>• Social Learning Theory</li> <li>• Social Network Theory</li> <li>• Intrinsic/Extrinsic Motivation Theories</li> </ul>	Tool for explain the concept of professional identity [50]
8	Ellis R. & et al.	2015	Journal of Nursing & Care	UK	<ul style="list-style-type: none"> <li>• Erikson</li> <li>• Personal Construct Theory (George Kelly 1955)</li> <li>• Festinger</li> </ul>	Instrument to Measure Professional Identity and Values in Nursing [51]
9	Tan, Ch. P.	2015	Studies in Higher Education	Netherlands	Not stated	Professional Identity Five Factor Scale (PIFFS) [52]
10	Kalet A. & et al.	2016	Medical Teacher	USA	Constructive-Development Theory (Kegan Theory)	professional Identity Essay (PIE), the Defining Issues Test (DIT2) and students' reflections [9]
11	Mylrea M.F. & et al.	2017	Currents in Pharmacy Teaching and Learning	Australia	Self-determination Theory (SDT)	Pharmacy Motivation Scale (Pharm-S) [28]
12	Moola S.	2017	Global Journal of Health Science	KSA	Social Identity Theory (Henri Tajfel 1970)	Nurses' Professional Identity Scale (NPIS) [34]
13	Kanefuji A. & Nakatani H.	2017	Health	Japan	Not stated	Professional Identity Structure [53]
14	Miyoshi M. & et al.	2019	Yonago Acta Medica	Japan	Not stated	questionnaire (Professional Identity Scale of Nurses ( [33]
15	Tagawa M.	2019	BMC Med. Educ.	Japan	Constructive-Development Theory (Kegan Theory)	Developing Scale (DS) (instrument to evaluate the degree of personal maturation and professional development in terms of socialization) [39]
16	Tagawa M.	2020	BMC Med. Educ.	Japan	Constructive-Development Theory (Kegan Theory)	Stage-specific Attribute Scales (SASs) [54]
17	Li R. & Lou J.	2022	Healthcare	Taiwan	Social Learning Theory and Communities of Practice	Professional Identity (PI) scale [55]

## Study findings

### A) Analytical Descriptive Studies About The Specifications And Psychometric Characteristics Of The Tools

Included studies either developed the tools for the first time (14 studies) or used tools developed by other studies (3 studies). If the first article was not available or has a language other than English [56], the next article that used the same tool was included. If the tool was developed in one study and its psychometrics in another, the second study was also mentioned.

Studies on the target groups were different. Most of the target groups studied were nursing students and then students of medicine. The only target group of three studies was specialists in various profession of health sciences. Of the 17 included studies, two made no reference to tool psychometrics. (Table No. 3)

Table 3

Analytical descriptive studies about the specifications and psychometric characteristics of the tools

Authors	Target group	Study design	Data collection	Name tool1	used/developed tool	Psychometric properties	Assessed concept
Brown & et.al. 1986	Nurses	Quantitative and Qualitative	Questionnaire	Professional Identity Questionnaire (PIQ) [44]	Developed	<p><i>Reported by Toben D. &amp; et al. for medical students (2021) [57]</i></p> <p><b>Validity:</b></p> <ul style="list-style-type: none"> <li>• Inter item Content validity Index (I-CVI)</li> <li>• Construct validity (Exploratory Factor Analysis)</li> <li>• Concurrent validity (Self-regulation Scale (SRQ-A))</li> </ul> <p><b>Reliability:</b></p> <ul style="list-style-type: none"> <li>• Internal consistency (Cronbach's Alpha)</li> <li>• Stability (Pearson's correlation test)</li> </ul>	PI*
Cowin, L. 2001	Nursing students	Quantitative and Qualitative	Scale	Nurse Self Concept Questionnaire (NSCQ) [45]	Developed	<p><b>Validity:</b></p> <ul style="list-style-type: none"> <li>• Content validity (expert pannel)</li> <li>• Construct validity (Exploratory and Confirmatory factor analyses)</li> </ul> <p><b>Reliability:</b></p> <ul style="list-style-type: none"> <li>• Internal consistency (Cronbach's alpha)</li> <li>• Intra-item correlations</li> </ul>	PI

\* Professional Identity

\*\* professional Identity Development

\*\*\* Professional Identity Formation



Authors	Target group	Study design	Data collection	Name tool1	used/developed tool	Psychometric properties	Assessed concept
Madill, A. 2005	Medical students	Quantitative and Qualitative	Repertory grids	Repertory Grids [46]	Developed	<b>Validity:</b> • Construct validity (Principle Components Analysis (PCA))  <b>Reliability:</b> Internal consistency (Spearman-Brown test and McQuitty's elementary linkage analysis)	PID**
Adams K. & et al. 2006	Health and Social Care student	Quantitative	Scale	Macleod Clark Professional Identity Scale MCPIS [47]	Used (Created by Brown R. & et al. (1986)) [44]	<b>Validity:</b> • Construct validity (Exploratory Factor Analysis)  <b>Reliability:</b> • Internal consistency (Cronbach's Alpha)	PI
Crossley J. & Vivekananda-Schmidt P. 2009	Medical students	Quantitative	Scale	Professional Self Identity Questionnaire (PSIQ) [48]	Developed	<b>Validity:</b> • Content validity  • Construct validity (Difference between novice and expert students with Spearman's correlation co-efficient)  • Construct validity (Exploratory factor analysis)  <b>Reliability:</b> Internal consistency (Cronbach's Alpha)	PI

\* Professional Identity

\*\* professional Identity Development

\*\*\* Professional Identity Formation

Authors	Target group	Study design	Data collection	Name tool1	used/developed tool	Psychometric properties	Assessed concept
Hao Y. F. 2014	Nursing students	Quantitative and Qualitative	Scale	Professional Identity Scale for Nursing Students (PISNS) [49]	Developed	<b>Validity:</b> <ul style="list-style-type: none"> <li>• Content validity</li> <li>• Construct validity (Exploratory Factor Analysis)</li> </ul> <b>Reliability:</b> <ul style="list-style-type: none"> <li>• Internal consistency (Cronbach's Alpha, coefficient alpha and split-half Spearman Brown)</li> </ul>	PI
Goltz H.H. & Smith M.L. 2014	Health education and Health promotion specialists	Review	Eassy	Tool for explain the concept of professional identity [50]	Developed	Not reported	PI
Ellis R. & et al. 2015	Nurses and Nursing students	Quantitative and Qualitative	Scale	ISA/Ipseus tool (Instrument to Measure Professional Identity and Values in Nursing [51])  <i>Ipseus is a powerful psychological software tool</i>	Developed	<b>Validity:</b> <ul style="list-style-type: none"> <li>• Face validity</li> <li>• Construct validity</li> </ul>	PI
Tan, Ch. P. 2015	Students in a wide range of professions social and healthcare	Quantitative	survey instrument	Professional Identity Five Factor Scale (PIFFS) [52]	developed	<b>Validity:</b> <ul style="list-style-type: none"> <li>• Content validity</li> <li>• Construct validity (confirmatory factor analysis)</li> </ul> <b>Reliability:</b> <ul style="list-style-type: none"> <li>• Coefficient H test</li> </ul>	PID
Kalet A. & et al. 2016	medical students	Quantitative and Qualitative	Eassy	Professional Identity Essay (PIE), the defining issues test (DIT2) and students' reflections [9]	Used (Created by Monson, V. E. & et al. (2008)) [58]	<b>Reliability:</b> <ul style="list-style-type: none"> <li>• Inter-rater reliability</li> <li>• Intra-rater reliability</li> </ul>	PIF***

\* Professional Identity

\*\* professional Identity Development

\*\*\* Professional Identity Formation

Authors	Target group	Study design	Data collection	Name tool1	used/developed tool	Psychometric properties	Assessed concept
Mylrea M.F. & et al. 2017	Pharmacy students	Survey	Questionnaire	Pharmacy Motivation Scale (Pharm-S) [28]	developed	<b>Validity:</b> • Convergent validity  • Face validity )Confirmed  readability and comprehension) • Content validity • Construct validity (Exploratory factor analysis) <b>Reliability:</b> • Internal consistency (Cronbach's Alpha and Spearman-Brown test)	PID
Moola S. 2017	Nursing students	Quantitative	Scale	Nurses' Professional Identity Scale (NPIS) [34]	developed	<b>Validity:</b> • Content validity • Construct validity (Exploratory factor analysis) <b>Reliability:</b> • Internal consistency (Cronbach's Alpha)	PI

\* Professional Identity

\*\* professional Identity Development

\*\*\* Professional Identity Formation

Authors	Target group	Study design	Data collection	Name tool1	used/developed tool	Psychometric properties	Assessed concept
Kanefuji A. & Nakatani H. 2017	Nurses	Survey	Questionnaire	Professional Identity Structure [53]	developed	<b>Validity:</b> <ul style="list-style-type: none"> <li>• Construct validity (Exploratory factor analysis and confirmatory factor analysis)</li> <li>• Divergent validity with Spearman's correlation coefficient (self-esteem scale)</li> </ul> <b>Reliability:</b> <ul style="list-style-type: none"> <li>• Internal consistency (Cronbach's Alpha)</li> <li>• Construct validity (Difference between novice and expert students with Kruskal-Wallis test)</li> </ul>	PI
Miyoshi M. & et al. 2019	Nursing and Clinical laboratory students	Survey	Questionnaire	questionnaire)Professional Identity Scale of Nurses) [33]	Used  (Created by Hatano K. & Onodera T. (1993)) [56] (Japanese language)	• Not reported	PIF
Tagawa M. 2019	Medical students, Residents and Experienced Medical doctors (instructors)	Quantitative	questionnaire	Developing Scale (DS)  (instrument to evaluate the degree of personal maturation and professional development in terms of socialization) [39]	developed	<b>Validity:</b> <ul style="list-style-type: none"> <li>• Construct validity (Exploratory factor analysis)</li> </ul> <b>Reliability:</b> <ul style="list-style-type: none"> <li>• Internal consistency (Cronbach's Alpha)</li> </ul>	PIF

\* Professional Identity

\*\* professional Identity Development

\*\*\* Professional Identity Formation

Authors	Target group	Study design	Data collection	Name tool1	used/developed tool	Psychometric properties	Assessed concept
Tagawa M. 2020	Medical students, Residents and Experienced Medical doctors (instructors)	Quantitative	Questionnaire	Stage-specific Attribute Scales (SASs) [54]	developed	<b>Validity:</b> • Construct validity (Difference between novice and expert respondents)  <b>Reliability:</b> • Internal consistency (Cronbach's Alpha)	PIF
Li R. & Lou J. 2022	Nursing students	cross-sectional survey	Scale	Professional Identity (PI) scale [55]	developed	<b>Validity:</b> • Construct validity (confirmatory factor analysis)  • Content validity  <b>Reliability:</b> Internal consistency (Cronbach's Alpha)	PI
* Professional Identity							
** professional Identity Development							
*** Professional Identity Formation							

## B) Analytical Descriptive Studies About Underlying Theories Of Tools

Of the 17 included studies, four were not based on a specific theory. A wide range of theories were identified in studies where identity theories were used more often than other theories. In identity theory, social identity theory and then Kegan's constructive-developmental theory were used for tool development. (Table 4)

Table 4  
Analytical descriptive studies about underlying theories of tools

Theory domain	Theories subdomain	Authors, years	Definition
sociological theory	symbolic interactionism theory (Horton Cooley 1902 & Herbert Mead 1934)	Hao Y. F., 2014	Symbolic interactionism is a micro-level theoretical framework and perspective in sociology that deals with the way society is created and maintained through repeated interactions between individuals. In other words, it provides a framework for better understanding how individuals interact with each other to create symbolic worlds and how these worlds create individual behaviors [59].
constructivist psychological theory	Personal construct theory (George Kelly 1955)	Madill, A., 2005 Ellis R. & et.al. 2015	In constructivist psychological theory, people form unique ideas (i.e., their concepts) about how the universe works and then use them to interpret their information and experiences. In other words, this theory attributes differences between individuals to different ways of interpreting the events of the world around them[60] .
	psychosocial development theory (Erickson Theory)	Hao Y. F., 2014 Ellis R. & et.al. 2015	In the psychosocial development theory Erickson suggests, the identities of individuals in eight stages of psychosocial development, from infancy to adulthood, grow in a predetermined order. At each stage, a person enters a socio-psychological crisis that can have a positive or negative impact on the development of his identity. In Erickson's view, such crises are of a socio-psychological nature because they consider the individual's mental needs to be in conflict with the needs of society[61] .
Motivation theories	Self-determination theory (SDT) (Ryan and Deci in the 1980s)	Mylrea, M.F., 2017	The self-determination theory is a macro theory about human motivation and personality that relates to the to the natural growth tendencies and psychological needs of individuals [62].  This theory, which describes a chain of motivation regulators, has been proposed as a convenient framework for studying students' motivation. This theory shows that individuals can determine their own destiny when their needs for competence, connection, and independence are met [28].
	Intrinsic / Extrinsic motivation theory	Goltz, H.H., 2014	Motivational theories are defined as the process of initiating, directing, and maintaining goal-directed behavior. They essentially move people to action to achieve a goal or satisfy a need or expectation [63]. These theories give an understanding of what causes an individual to turn towards a particular goal or outcome. These theories are numerous and vary (internally or externally) based on the specific needs that a person is trying to meet. The Maslow motivation theory is one of the most recognized and influential theories about motivation [64].
social psychology theory	Cognitive dissonance theory ) Festinger 1957)	Ellis R. & et.al. 2015	The Cognitive Dissonance theory shows that we have an internal incentive to keep all our attitudes and behaviors harmonious and avoid dissonance. This theory is known as the principle of cognitive compatibility. Disharmony between attitudes or behaviors causes cognitive dissonance or psychological discomfort in the individual. Thus, to reduce it and restore to equilibrium, changes occur in one of the attitudes, beliefs or behaviors. Therefore, people who are in a state of cognitive dissonance will take measures to reduce their levels of inconsistency [65, 66].
	Realistic conflict theory (Campbell 1965)	Brown & et.al. 1986	Realistic conflict theory directly deals with intergroup conflicts and how groups perceive and behave toward each other. When there is competition for limited resources, obvious social conflict can arise between groups. The theory also explains how feelings of prejudice and discrimination towards the enemy group are accompanied by intergroup hostility and reinforce intra-group solidarity. Hostility can arise from a war over things like political power or life style[67, 68] .
Social learning theories	Social learning theory (Albert Bandura 1977)	Goltz, H.H., 2014 Li R. & Lou J. 2022	The Social learning theory proposed by Albert Bandura in 1977 stresses the importance of observing, patterning and copying other people's behaviors, attitudes and emotional reactions. Social learning theory considers how environmental and cognitive factors interact to affect learning and human behaviors [69].
	Social network theory (Wilson 1975)	Goltz, H.H., 2014	Social network theory is a study of how individuals, organizations or groups interact within their network. It is easier to understand theory when you examine every single component, starting from the largest element, which are networks, and working down to the smallest element, which are individuals [70].

Theory domain	Theories subdomain	Authors, years	Definition
Identity theories	Social identity theory (Henri Tajfel 1970)	Adams, K., 2006  Goltz, H.H., 2014  Moola, S., 2017  Brown & et.al. 1986	According to Social identity theory, individuals take a part of their identity - their social identity - from the groups to which they belong (e.g., identity as "student", "woman", "left-handed", etc.) [71].  Social identity theory is an interactive social psychological theory that addresses the role of self-concept and related cognitive processes and social beliefs in group processes and intergroup relations. The purpose of social identity theory is to identify and predict conditions in which individuals think of themselves as individuals or members of the group [72].
	Self-concept theory	Cowin, L., 2001	Self-concept is one of identity theories and various definitions are presented for it. The core definition of self-concept according to Rosenberg (1979) is: "the totality of an individual's thoughts and feelings having reference to himself [or herself] as an object"[73]. Self-concept is the mental images that individuals form about themselves [74]. Simply put, self-concept refers to how we think about ourselves and how we should think, behave, and play various roles in our lives.  Self-concept is a multidimensional feature. For example, people have various roles, such as mothers, teachers, students, democrats, intellectuals, and so on. Each of these roles influences self-concept. "Real self-concept" is based on one's perceptual reality, and "ideal self-concept" is a point of reference compared with real self. The difference between the two leads to a motivational force that drives the individual up. Both real and ideal self-concepts have social dimensions [75].
	Constructive-developmental theory (Kegan 1982)	Kalet, A., 2016  Tagawa, M., 2019  Tagawa, M., 2020	Constructive-development theories were developed based on the works of Piaget, Kohlberg and Maslow [76–78], and state that the context is important in the making of meaning [79]. Meaning-making in people is influenced by external and internal factors including the individual's physical environment, individual's personal actions, behaviors and feelings, and interaction with others. By presenting a model based on Constructive-development theory, Kegan offers a description of the process of movement between the various stages of identity formation [78, 80]. He (1982) believes that identity development takes place in five distinct stages and in three dimensions: cognitive (the nature of knowledge), intrapersonal (individual goals, values, and self-belief) and interpersonal (the well-known beliefs, values, and goals of others) [78, 80]. Individuals move from the self-centered concept of an identity that only considers the self to the formation of a professional and moral identity that conform to the expectations, norms, and criteria of a profession (considering the interests of others before their own interests and losing their ambitions to serve the society) [81].

## Discussion

The results of this study identify the reliable and valid tools, corresponding to the proper theories, for assessing and measuring the formation and development of professional identity in Health Profession Education. Out of the 17 studies included in the present scoping review, 14 used reliable and valid tools for the assessment of the formation and development of professional identity. There were also 13 tools developed based on specific underlying theories.

The available studies to assess the formation of identity have used three strategies more than others: standard inventories or repertory grids, open-ended interviews and open essays [12]. A variety of Scales or questionnaires can also be found for assessing identity formation in studies [39, 54]. It should be noted that there were several qualitative studies using open ended interviews and reflection writing that emphasized on different influential aspects for the formation and development of professional identity. Such studies were not included in our research [82]. In this study, only tools such as standard inventories or Repertory grids [46], scales or questionnaires [28, 33, 34, 44, 45, 47, 48, 51–53, 55] and open essays [12, 50] were included. Psychometrics of these instruments were either conducted in the study or were performed in future studies for the same target group or another one. Madil study (2005) uses tools such as repertory grids based on George Kelly's Personal Construct Theory and thereby investigates identity changes in medical students during the first year of medical education, especially in relation to their experience with cadaver dissection [46].

Tagawa's studies from 2019 to 2020 are among the studies that have developed scales and questionnaires to assess the formation and development of professional identity. Based on Kagan's theory, these studies created a Developing Scale (DS) and a quantitative questionnaire consisting of 27 items [39, 54]. Some studies have also used open essays tool to assess the professional identity and its formation or development and have used reflection writing. Among these studies, those aiming at developing and using the open essays tool were included in our study [9, 12, 25, 50]. Open essays are in fact open answers to questions and are considered as a qualitative tool. One of these tools is found in the Bebeau's study in 2012. He proposed the Professional Identity Essay (PIE) tool for the formation and development of professional identity in dental students based on Kagan's constructive-developmental theory [12]. He stated that this tool for admission to colleges is a potential source of information about identity development and formation. However, considering the fact that the use of essay and the answers to open questions in a monitored environment often reflects the training of teachers to students to develop their professional identity with the help of reflection, it may not actually

show the level of identity of individuals in real terms [12]. Kalet et al. adapted and used this tool to measure the professional identity formation in medical students in their 2016 and 2018 studies [9].

Despite high emphasis on the procedural nature of the professional identity formation, some of the identified assessment methods are based on observable behavior. But relying on visible behaviors alone will lose the recognition of important aspects of professional identity [16]. However, other studies believe that by measuring the visible behaviors and revealing some specific characteristics of the professional identity, a snapshot of the mentioned path and process is obtained [38]. These overall views can help one identify the path and the process of forming the professional identity. Also, Cruess, in his study in 2016, considers the main purpose of assessing the professional identity formation and his proposed "Is" level to be on top of Miller's pyramid to determine whether these behaviors and characteristics are an integral part of the learner's identity or not [16].

However, according to the emphasis of researches on developmental theory, the professional identity is a long and continuous process in the direction of formation and development. It is stable for relatively long periods, and generally makes its presence felt in dynamic transitions. There is also the possibility that a measurable growth in the professional identity formation will be expected in each student after a year and a half of training [25]. Considering the emphasis of studies on the process and continuous nature of the formation and development of professional identity, none of the tools identified in the studies had investigated the change in the formation of students' professional identity over time in the form of cohort study.

This hypothesis that the professional identity formation in students is a smooth, predictable, and linear way is an entirely untrue hypothesis. Basically, the pathways of development for every student are different from others and they are completely dependent on the context [9]. Cruess stated in 2015 that the professional identity formation in which medical students transform from beginners to people with the identity of a doctor will not only have a procedural nature but also have a variety of dimensions [83]. Some experts of linear models have considered the growth of adult professional identity very simple, but medical specialists consider the development and professional identity formation to be a very complex cultural and social phenomenon. To them, the professional identity formation is a multi-dimensional, evolving, and lifelong process during one's professional life rather than a procedure with a final destination [2, 9, 23, 27, 84–87].

Among the studies that deal with the non-linear nature of development and professional identity formation and try to quantify the complexity and processes based on the professional identity formation, one can refer to the Tagawa study which was carried out between 2019 and 2020. By considering the constructive-developmental theory of Kegan as the basis of research, Tagawa devised a development scale using a quantitative questionnaire with multi-step scales [39, 54]. He stated that the development scale could be a useful indicator for examining the progress of the individual and the developing professional identity of medical students and the process of their admission to professional society [39]. Moreover, using a quantitative questionnaire with multistage scales can facilitate the measuring and assessment of complexity and processes based on the professional identity formation [39, 54].

Kalet et al. drawing on Kagan's constructive-developmental theory also reported different individual patterns in their studies in 2016 and 2018 in general and addressed the non-linear nature of professional identity development [9, 25]. They also proposed that in the process of professionalism understanding and formation and development of professional identity we should move beyond the "shallow" understanding obtained by checklists of values, personality characteristics, or behaviors [9].

Several experts in their studies point out that one of the most important tools for assessing professional identity formation is self-reporting tools [16, 24, 88]. Basically, a large number of tools used are self-reporting. However, due to the complexity of the process of professional identity formation and its multidimensional nature, assessing and measuring it will require more complete self-reporting tools by adopting multidimensional assessment strategies. More comprehensive tools that assess the impact of experiences on the formation of a person's professional identity have a clear conceptual framework and provide the possibility of analyzing the continuous and non-linear process of professional identity formation. Valid and reliable tools, in addition to being applicable on a wide scale, consider the limitation of intercultural studies (considering that the professional development is influenced by the culture and context of any society) and facilitate assessment and identity development methods in Health Profession Education in different paradigms and among various national and ethnic communities [38, 39].

The results of this study will contribute to the future research in making informed decisions for the selection or development of a reliable and valid tool based on a clear conceptual and theoretical framework; tools to assess the formation and development of professional identity not only among students, but also among specialists in various fields of health sciences. Also, the relatively high diversity of identity and growth theories as theories underlying the tools developed in the studies can provide the possibility of comparing these theories to better explain the formation and development of professional identity.

## Review Strengths And Limitations

There were several strengths and limitations in this scoping review. In terms of strengths, it can be pointed out that we have selected the process of study selection and search strategy in databases generally and extensively to ensure that nearly all the studies corresponding to the research question have been reviewed. Also, given the recognition of the reliable and valid tools by adopting specific theories as the basis of the study, especially identity development theories, these results can provide a valuable basis for future studies. In terms of limitations, it can be noted that



deleting non-English articles may result in language bias. In addition, the quality of the studies entered was not evaluated, although this was accepted in scoping review. Some have suggested that the absence of critical appraisal inherently limits scoping review methodology and its ability to identify "low-quality studies" [89].

## Conclusion

In general, the results of this scoping review will help the interested researchers to use its results for selecting and developing valid and reliable tools, based on clear conceptual and theoretical frameworks for measurement and assessment of the formation and development of professional identity in Health Profession Education. It will also help researchers in the development of valid and reliable tools, in accordance with the appropriate underlying theories that correspond to the complexities of the formation of professional identity and its non-linear nature.

## Abbreviations

TUMS: Tehran University of Medical Sciences

PI: Professional Identity

PID: professional Identity Development

PIF: Professional Identity Formation

## Declarations

### Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon request.

### Ethics declarations

#### Ethics approval and consent to participate

Our study was confirmed by the Institutional Review Board and the TUMS Ethics Committee (Code of Ethics IR. TUMS. MEDICINE. REC.1398.960). We explicitly confirm that our research methods were carried out in accordance with the relevant guidelines and regulations of the Ethics Committee of Educational Research at TUMS. Furthermore, the experimental protocol was assessed and approved by the department of medical education at TUMS.

#### Consent for publication

Not applicable.

### Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to the counter's data-sharing policy but are available from the corresponding author upon reasonable request.

### Competing interests

The authors declare that they have no competing interests.

### Funding

This study was part of a Ph.D. thesis done and supported by Tehran University of Medical Sciences.

### Authors' contributions

ZST and MKM were involved in the conceptualization, design, and implementation of the study. ZST and MKM made substantial contributions to the analysis and interpretation of data. ZST and MKM have drafted and revised the manuscript. HA has revised the manuscript. All authors reviewed the entire manuscript for editing, feedback, and approval.

### Acknowledgments

Thanks to Dr. Rasoul Masoumi for generously contributing their time and expertise.

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## Figures

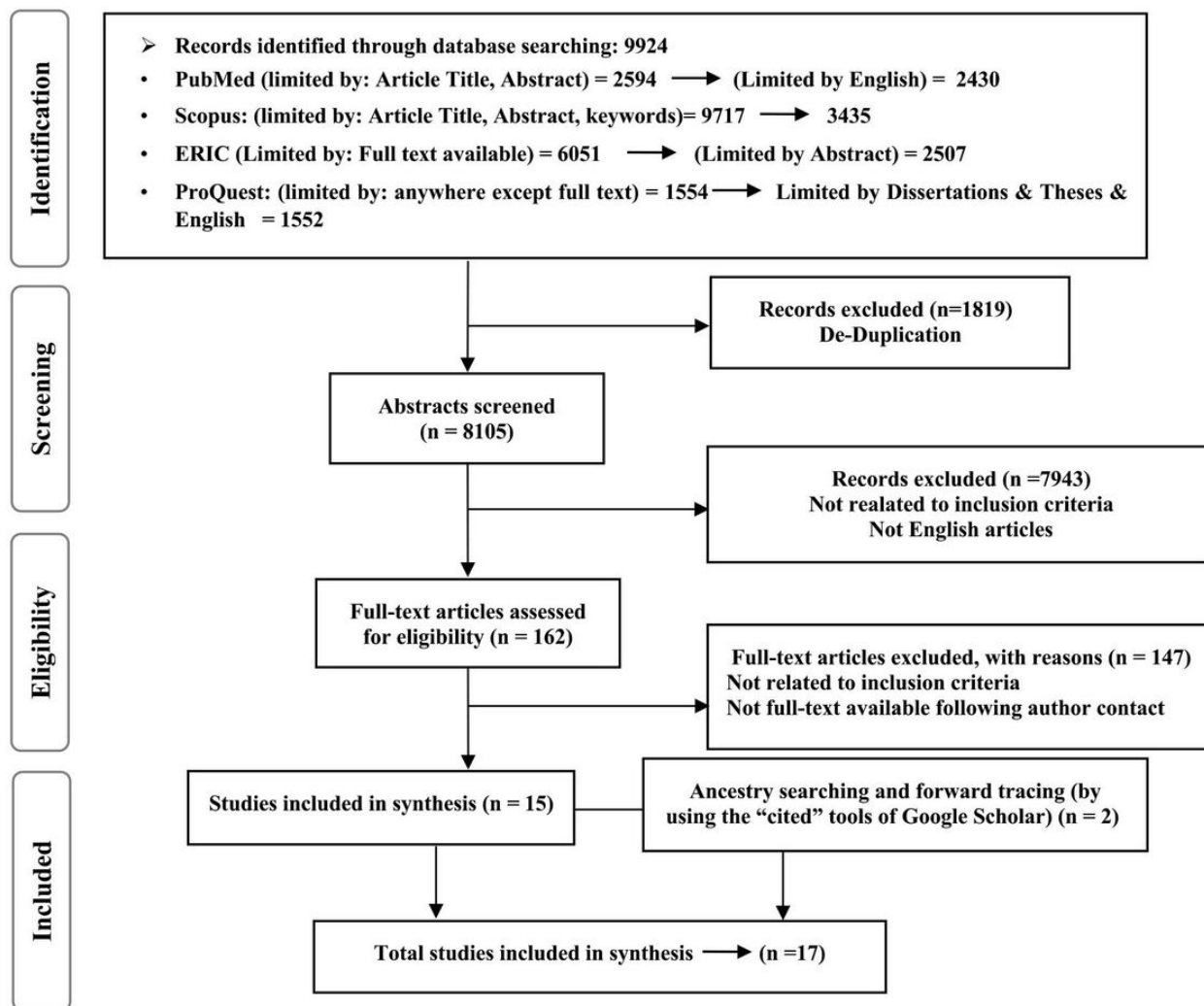


Figure 1

PRISMA flow diagram. Adapted from Moher et al. [43]