

REVIEW

Perceptions of Self of Persons with Visible Artificial Devices : A Review of the Literature

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Abstract : Not much is known about the self-perceptions of persons using prosthetic devices. The purpose of the literature review was to explore the self-perceptions of persons living with visible artificial devices from published articles between 2010 and 2017. Using key words to search for published literature in the PubMed, CINAHL, IEEE Proceedings, and Scopus indices showed 680 articles. Braun and Clarke's six phases of qualitative thematic analysis were used on 25 articles meeting the inclusion criteria, revealing 29 data extracts (themes) as data summaries. Three key thematic categories were revealed : *Body image and ownership, integration of prosthetic device into the self-body, and suspended enjoyment or delight, reflecting the longings for completeness affecting persons' use of prosthetic devices.* Consistent with self-perceptions understood through social biases and customs, completeness is achieved through the happy paradox of a person made whole through artificial devices. This experience informs nursing practice in helping people find meaning in their life. Further research into self-perceptions with prosthetic devices is essential, particularly those reflecting the cultural influences of artificial devices on quality of life. *J. Med. Invest.* 66 :58-64, February, 2019

Keywords : Nursing, Perceptions, Prosthetics, Self-Perceptions, Visible Artificial Devices

INTRODUCTION

Even though the perception of oneself as a 'complete' human being may constitute the main concern in developing replacement parts for missing human body parts, some critical questions remain or are taken for granted, such as how a person lives with these artificial replacement parts or how he or she appreciates how these devices help in completing himself or herself as a person. Still, other than the person's understanding of his or her own completeness, a bigger question remains. How do others view his or her completeness? Not only does this question concern living with artificial devices that may be invisible, but significantly, it also considers living with artificial devices which are clearly visible. Critical to this appreciation of being complete persons (1) is understanding how one lives out the meaning of his or her own life while living with clearly visible artificial devices.

While possessing artificial devices may help fulfill the attribute of being complete as a person from a logical positivist view (2)—a view that considers human beings as the sums of their parts—not much is known about their personal awareness of self, which comes with the understanding, appreciation, affirmation, and celebration of being complete and always whole moment to moment. A certain influence can also be felt from the assumption that persons with visible artificial devices live their lives with enchantment at being 'completed' by these devices.

PURPOSE OF THE STUDY

The purpose of the literature review was to explore the self-perceptions of persons living with visible artificial devices from published articles between 2010 and 2017

THE METHOD

Qualitative thematic analysis is a method for identifying, analyzing, and reporting patterns or themes by organizing and describing data sets into rich detail (4). Thematic analysis is widely used but there is no clear agreement about what thematic analysis is and how to go about it (5-7). To clarify the issue, Braun and Clarke's (8) six phases of thematic analysis was used as the method of analyzing research data. These phases are *familiarizing with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report.* Through its theoretical freedom, thematic analysis was used as a flexible and useful research tool, which provided a rich, detailed, and complex account of data sets as thematic categories.

In this study, thematic analysis involved the search for and identification of common threads. Using keywords such as perceptions of self, visible artificial devices, nursing, and prosthesis, a review of literature was conducted to retrieve published research studies from four common and popular search engines available in academic libraries, specifically PUBMED, CINAHL, IEEE Proceedings, and SCOPUS. All English-language scientific publications from January 2010 to July 2017 were considered. However, it was found that Ritchie *et al.* (9) had conducted a review of literature on a similar topic that included published articles prior to 2010. This had informed the focus of the current review, in which adjustment of the inclusive dates was made starting in 2010 and

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ending in 2017.

Each full-text article that met the inclusion criteria was read, reread, and analyzed as recommended in the six phases described by Braun and Clarke (8). Data items were derived from the retrieved abstracts of each article and classified according to themes. From the data extracts, data sets were identified as Key Themes. Table I exhibits the thematic data analysis as Braun and Clarke described.

Establishing Inter-Rater Reliability : Using the Databases

Four co-authors participated in the search and analysis of pertinent articles using a specific database source. For example, co-author (YM) searched the CINAHL database for articles that met the inclusion criteria. This effort distribution ensured that all of the co-authors contributed valuable and appropriate effort towards collecting findings as legitimate co-authors of the study. Each of the four co-authors analyzed articles which were retrieved from search engines or databases assigned to them individually. Each co-author identified and listed the data extracts, or themes, and subsequently cross-referenced them against the identified data extracts from the other three authors' lists. Deliberations regarding these extracted themes based on the data items, namely the abstracts or summaries, of each article were made for the purpose of achieving a thematic consensus.

With the CINAHL database, the keywords 'perception AND prosthesis AND limb' were used. The search yielded only twelve articles. To increase the likelihood of retrieving more pertinent articles, the keywords 'body-image AND prosthesis AND artificial AND limb AND perception' were used for SCOPUS, in addition to the original three keywords. Nevertheless, only fourteen articles were found. Of these, however, only twelve full-text articles were available even with the assistance of the Florida Atlantic University (FAU) Library System.

For the IEEE database, the keywords 'Prosthesis/Limb/Self Perception/Psychological/Human/Life' were used, in addition to the keywords used for CINAHL and SCOPUS. Even with these keywords used singly, or in various configurations, only ten relevant articles were found. It is important to note here that the IEEE database seemed to contain more research studies pertaining to or focused on the design and development of artificial devices. Regardless, only seven full-text published articles were found through the Florida Atlantic University (FAU) Library system.

With PubMed, the keywords 'Prosthesis/Limb/Perception/Emotion' were used. Nine relevant articles were found, with one article eliminated as it duplicated an article retrieved through CINAHL. Of the remaining articles, only five full-text articles were made available using the FAU library system.

ANALYSIS OF DATA

Qualitative thematic data analysis was used to identify, extract, classify, and categorize data sets, themes, and key thematic categories to illuminate what is currently known about how persons with visible artificial devices perceive themselves as persons. Each article was identified using authors' names, titles, and data items (summaries), as well as abstracts of the articles. These were analyzed using data extracts as themes and data sets as key themes (see Table I). Adding to the analysis, a summary of data items was identified and exhibited in Table II. Themes were grouped according to each data set or (key theme) that described the self-perceptions of persons with visible artificial device(s). These data sets formed the structure of the description of the way persons who live with visible artificial devices perceive themselves as persons.

RESULTS/FINDINGS

There were four search engines or databases (PUBMED, CINAHL, IEEE Proceedings, and SCOPUS) used to retrieve articles using keywords and terms, such as 'prosthetic devices,' which provided published studies for review and analysis. Initially, the same keywords were used in all of the four databases, e.g. prosthesis, limb, and perception. From these keywords, 680 articles were found. However, further review of the retrieved articles based on the inclusion criteria resulted in more distinctive articles including device development. When citations were identified but were unavailable online and/or required to be purchased, complete citations were requested and secured through the Florida Atlantic University (FAU) Library in Boca Raton, Florida. Thirty-six (36) published articles were found that were relevant to the topic and met the inclusion criteria, making them suitable for analysis. Based on the qualitative thematic analysis strategy (3) the abstracts were first evaluated using the inclusion criteria and initially classified according to themes. Subsequently, the articles were read in full to determine their thematic focus regarding the perceptions of self of persons who use visible artificial devices.

Of the thirty-six research studies reviewed and analyzed for thematic content, eleven (11) articles were eliminated based on their emphasis, such as studies pertaining to the appreciation of design and development of artificial devices, which consisted of five (5) studies, and the studies which focused on development dynamics, which added up to six (6) articles. The final number of articles reviewed and analyzed were twenty-five (25) articles. The researchers carefully read and re-read the full-texts of each article. Following the process of qualitative thematic analysis (3) for identifying thematic content, themes were identified that reflected the focus and purposes of the study. Each researcher identified themes from each article. Deliberating on these themes, the co-authors reached a consensus and twenty-five (25) themes were identified and described.

From the twenty-five articles reviewed, twenty-nine (29) themes were identified, namely : *Body representation and body ownership ; embodiment ; self-attribution ; integration into body schema ; decreased enjoyment of artificial device ; integration with others ; body ownership ; body image anxiety and social discomfort ; integral to attitude ; perception of self with anatomically impossible configurations : body representation ; body image and physical attractiveness ; impaired sensory integration ; supernatural touch ; visual body image ; discrepancies in sense agency or ownership of self-body ; valuation of device ; exciting new avenues for movement ; self-image as an integrated part of the body ; prosthesis not only a tool ; representation and embodiment of reality ; sense of body ownership ; body representations and emotional states ; body representations ; dependence on perceptual judgment ; prioritizing function over cosmesis ; self-identify and impairment perspective ; experience of object as part of one's body ; augmentation and restoration of somato-sensation ; feeling rather than thought of stimulation under conditions of self-touch.* From these twenty-nine themes, three (3) data sets or key themes were revealed that describe the self-perception of persons using visible artificial devices. These are *body image and ownership*, with ten (10) articles ; *integration of prosthetic device into the self-body*, with nine (9) articles ; and *suspended enjoyment or delight* with six (6) articles.

INTERPRETATION AND DISCUSSIONS OF FINDINGS

The three key themes describing the self-perception of persons using visible artificial devices are hereon described and discussed. The discussion was based on each data set or key theme framed as expressions of significant thematic descriptions of current knowledge regarding the self-perception of persons who are using

Table 1. Summary of Articles : Authors, Titles, Search Engines/Database used, Themes, Types of Prosthesis and Key Themes.

| Number | Author | Title | Search engine | Data Extract or Themes | Type of Prosthetic Devices | KEY THEMES OR DATA SET |
|--------|---------------------------------|---|---------------|--|--|---|
| 1 | Aymerich <i>et al.</i> (2015) | The role of functionality in the body model for self-attribution | Scopus | Body representation and body ownership Embodiment Self-attribution | None | Key Theme NUMBER 1 BODY IMAGING AND OWNERSHIP |
| 2 | Beckerle <i>et al.</i> (2014) | Implementation, Control and User-Feedback of the Int2Bot for the Investigation of Lower Limb Body Schema Integration | IEEE | Integration into body schema | Int2bot | Key Theme NUMBER 2 INTEGRATION OF PROSTHESIS INTO THE BODY |
| 3 | Caldwell <i>et al.</i> (2016) | Impaired perception of sensory consonance and Dissonance in Cochlear Implant Users | PubMed | Decreased enjoyment of artificial device | Cochlear Implant | Key Theme NUMBER 3 SUSPENDED ENJOYMENT |
| 4 | Castellini <i>et al.</i> (2014) | sEMG-based estimation of human stiffness : towards impedance-controlled rehabilitation | IEEE | Integration with others | None | Key theme NUMBER 2 INTEGRATION OF PROSTHESIS INTO THE BODY |
| 5 | Crea <i>et al.</i> (2015) | The rubber foot illusion | Scopus | Body ownership | None | Key theme NUMBER 1 BODY IMAGING AND OWNERSHIP |
| 6 | Desteli <i>et al.</i> (2014) | Comparison of upper limb amputees and lower limb amputees : a psychosocial perspective | Cinahl | Body image anxiety and social discomfort | None | Key theme NUMBER 1 BODY IMAGING AND OWNERSHIP |
| 7 | Dyer <i>et al.</i> (2011) | The Fair Use of Lower-Limb Running Prostheses : A Delphi Study | Cinahl | Integral to attitude | Lower-limb running prosthesis | Key theme NUMBER 2 INTEGRATION OF PROSTHESIS INTO THE BODY |
| 8 | Giummarra <i>et al.</i> (2010) | Corporeal awareness and proprioceptive sense of the phantom limb | Cinahl | Perception of self with anatomically impossible configurations | Phantom limb | Key theme NUMBER 1 BODY IMAGING AND OWNERSHIP |
| 9 | Guterstam <i>et al.</i> (2011) | The illusion of Owning a Third Arm | Scopus | Body representation | Third arm illusion | Key theme NUMBER 1 BODY IMAGING AND OWNERSHIP |
| 10 | Henderson <i>et al.</i> (2010) | What is the Emotional Acceptance After Limb Salvage with an Expandable Prosthesis? | Cinahl | Body image and physical attractiveness | Limb salvage with an expandable prosthesis | Key theme NUMBER 1 BODY IMAGING AND OWNERSHIP |
| 11 | Hirakawa <i>et al.</i> (2014) | The relationship among psychological factors, neglect-like symptoms and postoperative pain after total knee arthroplasty | PubMed | Impaired sensory integration | Total knee arthroplasty | Key theme NUMBER 3 SUSPENDED ENJOYMENT |
| 12 | Hohwy <i>et al.</i> (2010) | Explaining Away the Body : Experiences of Supernaturally Caused Touch and Touch on Non-Hand Objects within the Rubber Hand Illusion | Scopus | Supernatural touch Visual body image | Rubber hand illusion | Key theme NUMBER 3 SUSPENDED ENJOYMENT |
| 13 | Ismail <i>et al.</i> (2016) | 'Robot' Hand Illusion under Delayed Visual Feedback : Relationship between the Senses of Ownership and Agency | Scopus | Discrepancies in sense agency or ownership of self-body | Robot hand illusion | Key theme NUMBER 2 INTEGRATION OF PROSTHESIS INTO THE BODY |
| 14 | Krausz <i>et al.</i> (2015) | Depth Sensing for Improved Control of Lower Limb Prostheses | IEEE | Valuation of device | Lower limb prostheses | Key theme NUMBER 2 INTEGRATION OF PROSTHETICS SELF |
| 15 | Lambrecht <i>et al.</i> (2014) | Miniature Low-Power Inertial Sensors : Promising Technology for Implantable Motion Capture Systems | IEEE | Exciting new avenues for movement | Implantable sensors | Key theme NUMBER 3 SUSPENDED ENJOYMENT |
| 16 | Marasco <i>et al.</i> (2011) | Robotic touch shifts perception of embodiment to a prosthesis in targeted re-innervation amputees | Cinahl | Self-image-integrated part of the body Prosthesis not a tool | Artificial leg prosthesis | Key theme NUMBER 2 INTEGRATION OF PROSTHESIS INTO THE BODY |
| 17 | Francesco Marini | Crossmodal representation of a functional robotic hand arises after extensive training in healthy participants | scopus | Representation and embodiment of reality | Functional prosthetic devices | Key theme NUMBER 1 BODY IMAGING AND OWNERSHIP |
| 18 | Sebastian Ocklenburg | Laterality in the rubber hand illusion | scopus | Sense of body ownership | Rubber-hand illusion | Key theme NUMBER 1 BODY IMAGING AND OWNERSHIP |
| 19 | Martin Riemer | Defensive activation during the rubber hand illusion : Ownership versus proprioceptive drift | scopus | Body representations and emotional states | Rubber hand | Key theme NUMBER 2 INTEGRATION OF PROSTHESIS INTO THE BODY |
| 20 | Martin Riemer | Action and perception in the rubber hand illusion | scopus | Body representations and dependence of perceptual judgment | Rubber hand illusion | Key theme NUMBER 1 BODY IMAGING AND OWNERSHIP |
| 21 | Sophie Ritchie | Perceptions of cosmesis and function in adults with upper limb prostheses : a systematic literature review. | cinahl | Prioritizing function over cosmesis | Multiple prosthetic devices- cosmesis or functionality | Key theme NUMBER 1 BODY IMAGING AND OWNERSHIP |
| 22 | Hugo Senra | Beyond the body image : A qualitative study on how adults experience lower limb amputation | scopus | Self-identify and impairment perspective | None Lower limb amputation | Key theme NUMBER 2 INTEGRATION OF PROSTHESIS INTO THE BODY |
| 23 | Manos Tsakiris | Hands only illusion : Multisensory integration elicits sense of ownership for body parts but not for non-corporeal objects | scopus | Object can be experienced as part of one's body | Wooden block and wooden hand | Key theme NUMBER 2 INTEGRATION OF PROSTHESIS INTO THE BODY |
| 24 | Dustin J. Tyler | Neural interfaces for somatosensory feedback : Bringing life to a prosthesis | scopus | Augment and restore somato-sensation | Somatosensory prosthetics | Key theme NUMBER 3 SUSPENDED ENJOYMENT |
| 25 | White <i>et al.</i> (2009) | 'Touch and feel?' Using the rubber hand paradigm to investigate self-touch enhancement in right-hemisphere stroke patients | PubMed | Persons can feel rather than think of stimulation under conditions of self-touch | Rubber hand | Key theme NUMBER 3 SUSPENDED ENJOYMENT |

Summary :

There were three (3) Key themes, namely ; 1) Body image and ownership, with ten articles containing themes pertaining to it ; 2) integration of prosthesis to self and body, with nine articles with themes referring to it ; and 3) suspended enjoyment with six articles having themes pertinent to it.

Table 2. Summary of Data Sets as Key Themes and Specific Source Article Numbers

| Key Themes/ | Article numbers/ Themes | Article numbers/ Themes | Article numbers/ Themes | Article numbers/ Themes | Article numbers/ Themes | Article numbers/ Themes | Article numbers/ Themes | Article numbers/ Themes | Article numbers/ Themes | Article numbers/ Themes |
|--|---|---------------------------------|--|---|---|---|--|---|---|--|
| Body Image and Ownership | 1 Body representation and body ownership ; Embodiment; Self-attribution | 5 Body ownership | 6 Body image anxiety and social discomfort | 8 Perception of self-anatomically impossible configurations | 9 Body representation | 10 Body image and physical attractiveness | 17 representation and embodiment of reality | 18 Sense of body ownership | 20 Body representations and dependence of perceptual judgment | 21 Prioritizing function over cosmesis |
| Integration of Prosthesis to Self and Body | 2 Integration into body schema | 3 Integration with others | 7 Integral to attitude | 13 Discrepancies in sense or ownership of self-body | 14 Valuation of device | 16 Self-image as an integrated part of the body ; Prosthesis not only a tool | 19 Body representations and emotional states | 22 Self-identify and impairment perspective | 23 Object can be experienced as part of one's body | 4 Integration with others |
| Suspended Enjoyment | 3 Decreased enjoyment of artificial device | 11 Impaired sensory integration | 12 Supernatural touch Visual body image | 15 Exciting new avenues for movement | 24 Augment and restore somato-sensation | 25 Persons can feel rather than think of stimulation under conditions of self-touch | | | | |

Legend : This table shows the numerical assignment of articles and sequentially connects the themes to the larger key themes proposed in the review.

visible artificial devices.

Body image and ownership

Ten (10) articles were found that contained themes relevant or pertaining to Body Image and Ownership, and were subsequently analyzed using the identified key theme. These articles were given the numbers 1, 5, 6, 8, 9, 10, 17, 18, 20 and 21 in the tables (please see Table 1 and 2). Body image is the naturally fashioned appearance of persons referring to themselves as human beings with distinct bodies. All persons have their own body images. Situations, however, may influence these images. For example, in health or in illness, one's images about one's body can focus on the structure or state of being healthy. Moreover, this imagery can change because of self-perception ; perhaps of a self-view of either strength or weakness, and of a self-view of imperfection or fragility. The latter can occur when incompleteness is critically perceived important because of missing parts during illness or injury, such as when amputation is performed. Similarly, *body ownership* is the perception that a person owns his or her body. For example, patients might be confused about the ownership of their leg after amputation or during use of prosthetics.

In four articles labeled numbers 5, 8, 9, and 18 in the tables, the authors described the phenomena of the rubber hand illusion (RHI), rubber foot illusion (RFI), and phantom limbs. RHI is a perceptual illusion causing one to get the feeling of ownership of a realistic rubber hand when it is placed in full view and synchronously stimulated with a person's own hand that is hidden from view (6). A related article, numbered 5 in the tables, shows that it is possible to elicit the perception of possessing a rubber foot when modality-matched stimulations are provided synchronously on the biological foot and to the corresponding rubber foot areas (7). An article published in 2011 refers to right hemispheric dominance for *body ownership* in healthy adults (8)), while Giummarra *et al.* discuss the so-called phantom limb, which is a perception of the existence of a limb even after it had been amputated (9). Paradoxically, as argued in article listed 9 in the tables, a person who had experienced amputation can also experience the illusion of a supernumerary limb, which means that he or she can feel the existence of an extra (third) limb (10). These illusions are often experienced as sensations of some body parts or sensations of false

stimulation even if the parts had been removed.

Three articles numbered 1, 17, and 20 describe what causes the perception of body ownership and embodiment (11-13), while the article listed 1 in the tables refers to the role of the human brain in causing the sensation once the body parts or prosthesis function well, and also show their own roles. The articles listed as 17 and 20 in the tables describe multi-sensory sensations, such as tactility and vision, as well as motor movements causing the perception of body embodiment and ownership (12, 13). These articles confirm that the actions of respective body parts function effectively with the multi-sensory stimulations caused by the sensorium made from the perception of body ownership.

The articles labeled 6, 10 and 21 in the tables refer to body image, patients' emotions, and satisfaction from using their prostheses (14-16), while the article by Desteli (number 6 in the tables) describes upper limb amputees struggling more with anxiety, restriction of activities, and worse adjustment to prosthesis than those with lower limb amputations (14). This is because hands are used more often in daily life, such as e.g. working, studying and housework. Common roles cannot be performed anymore if one loses one's hand.

The article listed as number 10 in the tables describes the reactions of children after limb salvage with endoprosthesis. It was observed that these children show a high level of happiness and good social interactions. Their youth enables them to enjoy their normal life when they start using prosthetic devices (15). Article number 21 explains the research satisfaction for upper limb prosthesis in terms of cosmesis and function as found by Ritchie, Wiggins and Sanford (4) in the systematic review of articles published between 1990 and 2010. It should be pointed out that the definition of cosmesis and its functionality are described in various forms in different articles, so there is not one common definition. Nevertheless, body image and ownership are intertwined with the experiences of amputees especially on the satisfaction and happiness gained from using prosthetic devices.

Integration of Prosthesis into the Self-body

Ten (10) articles published on the self-perception of persons using visible artificial devices focused on the integration that the artificial devices provided their recipients. These perceptions

included participants who had the following experiences : *Integration into body schema ; integration with others ; integral to attitude ; discrepancies in sense-agency or ownership of self-body ; valuation of device ; self-image as an integrated part of the body ; prosthesis as more than a tool ; body representations and emotional states ; self-identification and impairment perspectives ; experience of object as part of one's body.*

The articles listed as numbers 2, 3 and 4 in the tables focused on the integration of prostheses into the self-body. However, article numbers 3 and 4 focused on the integration with others without specificity—contrary to article number 2, which was focused on the body schema or representation. The article by Beckerle *et al.* (16), for example, noted that the integration of prostheses or wearable robotics into the body schema of their users is a fundamental requirement for the acceptance and control of such artificial devices. Duration and progress of integration are primarily influenced by visual, tactile, and proprioceptive perception. On the other hand, Caldwell *et al.* (17), and Castellini, *et al.* (18) noted that “the degree of consonant versus dissonant chord accompaniment does not impact subjective assessment of degree of pleasantness in Cochlear Implant (CI) users listening to real-world stimuli.” In addition, Caldwell *et al.* (17), and Castellini *et al.* (18) found that the system has potential applications in impedance control of rehabilitation devices such as upper/lower limb prostheses, self-powered orthoses, and exoskeletons leading to better integration with patients.

Another aspect about integration of body is attitude. The study by Dyer *et al.* (20) conducted in 2011 focused on how important attitude is in influencing self-perception. They noted “that the technology employed in prostheses could have some unfair aspects of being even if this conflict with new innovations can help athletes’ quality of use.” While the more recent study by Riemer *et al.* (21) presented a new approach to investigate the relationship between body representations and emotional states, the results indicated that ownership ratings and proprioceptive drift capture of different prosthetic devices have differences in ratings, whereas aspects of the Right Hand Illusion (number 19 in the tables) remain secured.

Furthermore, as the study by Ismail *et al.* (22) shows, discrepancies may be observed in the sense-agency or ownership of the self-body. The results revealed that participants felt the effects of the robot hand illusion (RHI) at a significantly greater level, with temporal discrepancies of less than 190 minutes, as compared with the longer temporal discrepancies both in the senses of ownership and agency. The discrepancy of ownership is similar to the theme on body image. However, the phenomenon shown here deals with their personal differences in terms of culture.

The 2015 study by Krausz *et al.* argues that their proposed algorithm allows for an accurate estimate of distance, angle of intersection, number of steps, stair height, and stair depth for a set of stairs in the environment (23). Nevertheless, the study conducted by Marasco *et al.* in 2011 (24) shows results that indicate that returning physiologically appropriate cutaneous feedback from a prosthetic limb drives a perceptual shift towards embodiment of the device. The conclusion also considers the subjective (self-reported) and objective (physiological) measures of embodiment (questionnaires, psychophysical temporal order judgments, and residual limb temperature measurements). The study suggests that this may help amputees to more effectively incorporate an artificial limb into their self-image, allowing the possibility that the prosthesis becomes not only a tool, but also an integrated body part.

However, a study conducted by Senra *et al.* in 2011 (25) reveals that changes in self-identity occurring after a lower limb amputation manifest beyond the patient’s body image and function, affecting the patient’s awareness of his or her impairment, biographical self, and any future projections. In addition, Tsakiris *et al.* (26) reveals

that introspective and behavioral results propose that participants experience a sense of ownership only when using the realistic prosthetic hand, suggesting that not all objects can be experienced as part of one’s body. Any variations in these devices seem to concern the value or importance of these devices to the person (articles numbered 13, 14, 16, 22, and 23 in the tables). These findings point to the idea of the effects of prosthetics on self-image. The combination of self and artificiality that our body focuses on move towards integrating the self-image with the idea of using prosthetic devices.

Suspended Joy and Delight

Six articles (numbered 3, 11, 12, 15, 24 and 25 in the tables) published on the self-perception of persons using visible artificial devices focused on the joy and delight that the artificial devices provided their recipients (17, 19, 27, 28, 29, 30). These perceptions included participants who had the following experiences : *Supernatural touch ; visual body image ; exciting new avenues for movement ; augmentation and restoration of somato-sensation ; excitement in feeling rather than thought of stimulation under self-touch.* These themes affirmed positive experiences. However, two research studies voiced some concerns about the experience of using artificial devices. These perceived experiences were decreased enjoyment of the artificial device, and impaired sensory integration.

While the intention of artificial device inventors and innovators may be to enhance the progress of persons into feeling ‘whole again,’ the aforementioned research studies showed that there is some form of ‘suspension,’ or deferral of the joy and delight in using an artificial device, which may have been intended as a consequence of its fabrication. Such findings point to the unpredictability of human beings, and the subjectivity operating in the idea of becoming ‘complete’ or whole again.

CONCLUSION

In this review, the self-perceptions of persons using artificial devices were revealed through the following key thematic categories, namely, 1). *Body image and ownership*, 2). *Integration of prosthetic device into the self-body*, and 3). *Suspended enjoyment or delight*. Using qualitative thematic analysis, the experience of self-perception among persons with artificial devices can be described as “*the integration of the persons’ body image with the artificial devices, specifically, that prosthetic devices influence the integration of artificial devices into the body of a person, contextualizing itself within the paradox of sadness and joy from the sensation of artificial completeness with incomplete body parts*”. These experiences inform nursing practice through the knowledge gained in anticipation of those persons’ understanding of themselves, fostering the ways of living out their personhood (1), and creating meaning in their new lives.

RECOMMENDATIONS

Further research into the self-perceptions of persons using artificial devices is essential, particularly studies that focus on the cultural influences of visible artificial devices on their body image. The attention directed towards rehabilitative education and its dynamics of care involving the public interest about how the experience of using artificial devices can influence persons’ lives is essential. The ultimate goal is understanding the significance of the effects of what the persons who use artificial devices can reveal, regarding the enhancement of their quality of human health and well-being.

LIMITATIONS OF THE STUDY

As an important topic consequent to the outcomes of recent wars—such as those veterans returning with missing or non-functioning limbs—the self-perception of persons who live with visible artificial devices becomes critical to the practice of professional nursing. Unfortunately, the review of the literature did not provide data on studies about military personnel or the civilian population who are forced by war to use visible artificial devices. Causes of missing limbs, such as congenital deformities, cancer, trauma, etc., were not clearly identified, although these causes may also provide wider understanding of the experience of using visible artificial device. While it may be interesting to determine whether or not the specificity of the lost human part influence the self-perception of others, this was not purposively addressed. Moreover, specific countries of origin, gender, or age were not included as variables of the review as well.

The research design and method of analysis using the qualitative thematic analytic process may be duplicable, but gaps in data generation can propel further research on the phenomenon. Furthermore, a review of the bibliographic reference for each article was not done because the overall process, from data gathering to manuscript preparation, was shortened by limitations and constraints on time. Moreover, with the recent scope of coverage of the data, one can assume that additional references may already have been included in the current analysis and interpretation of original studies, particularly in the systematic review of the literature prior to 2010.

CONFLICT OF INTEREST

There is no actual or potential conflict of interest that exist in this manuscript Perceptions of Self of Persons with Visible Artificial Devices : A Review of the Literature

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