# Factor Analysis of Upper Extremity Prosthetic Patient Acceptance

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## INTRODUCTION

Although there have been a number of studies that have attempted to investigate prosthetic upper limb prosthetic acceptance, very few have provided conclusive evidence to assess the overall clinical probability of wear. In a recent survey of upper limb prosthetic practitioners collective estimations were made with respect to the priority of the various factors that contributed to Upper Limb rejection as well as the rejection rates by level. From these factors a Bayesian forecasting model was constructed to provide an initial estimation of prosthetic acceptance.

## METHOD

From initial phone interviews and previous upper limb survey 12 factors were identified as possible contributors to overall acceptance including: Amputation Level, Functional Advantage, Patient Gadget Tolerance, Time to Initial Fit, Confidence of Prosthetist, Quality of Patient/Prosthetist Relationship, Socket and Harness Comfort, Weight, Cosmetic Quality, Therapy and Training, Peer and Family Support, and Age of Patient.

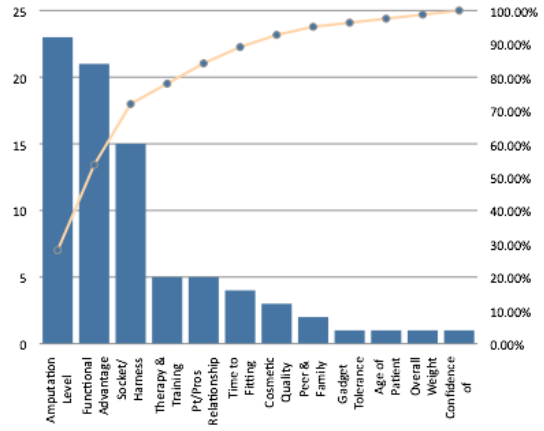
A survey was constructed and posted on a third-party survey hosting website from October 20 to November 8, 2013. There were 58 respondents who self-assessed their skill level which was normally distributed among novices, intermediates, experts, and specialists.

## RESULTS

Their aggregate responses with respect to level were recorded to be 79.6% for transrandial, 57.8% for transhumeral, and 32.8% for shoulder disarticulation which is fairly similar to the original study done in 1958 which indicated 75% for transhumeral, 61% for transhumeral, and 35% for shoulder disarticulation (Berger, 1958). When asked about the degree of strength each factor affects acceptance the aggregate opinion was that “Amputation Level” was the highest at 79.6, followed by “Functional Advantage” at 78.3, “Socket and Harness Comfort” at 77.7, “Peer and family Support” at 76.3, “Amount of Therapy and Training” at 73.5 and “Quality of Patient-Prosthetist Relationship” at 72.6.

## DISCUSSION

From this survey of the 12 factors those with the most consistent significance are listed in order: 1) Amputation Level, 2) Functional Advantage, 3) Socket & Harness Comfort, and 4) Peer/Family Support and 5) Prosthetic Competency. Many examinations fail to also include the important role of the peer and family support as well as the prosthetist-patient relationship. This could represent the consistency of smaller, but more innovative populations to accept technology.




## CONCLUSION

There are methods of functional prediction in lower extremity prosthetics such as the AMPPRO Ambulation Test and Amputee Mobility Detector (AMP) (Gailey, 2001, Stevens, 2009) that utilize greater degrees of probability and forecasting. One factor is that clinicians and researchers have both attempted to find a single factor that can influence success or failure. The characteristic of the high rating for all of the factors may indicate that clinicians were unable to delineate between the factors and rank those with greater probability. This could be that different combinations of factors greatly vary from patient to patient, that prosthetists differ widely in their opinions about rejection, or that prosthetists in general do not have a grasp of why rejection occurs. There appears to be some discrepancies as to whether rejection and acceptance are converses of each other. The question remains why acceptance rates have been largely unchanged and vary so greatly.

## CLINICAL APPLICATIONS

The amputation acceptance levels were used with the other factors using a 4-point value scale of .10, .25, .50, or .75 and calculated using Bayes’ Theorem for a number of case studies. Although not validated they may serve as analytic tool to assess subjective values of acceptance.

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