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Physical Therapy Nontreatment Events with Primary Physical Therapist

Stephen Johnson

PHYSICAL THERAPY NONTREATMENT EVENTS WITH PRIMARY PHYSICAL THERAPIST

By

Stephen Lee Johnson

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Stephen Lee Johnson

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Master of Public Health
Department of Environmental and Occupational Health

Guogen Shan, Ph.D.
Examination Committee Chair

Kathryn Hausbeck Korgan, Ph.D.
Graduate College Dean

Ge Kan, Ph.D.
Examination Committee Member

Qing Wu, Ph.D.
Examination Committee Member

Daniel Young, Ph.D.
Graduate College Faculty Representative

Abstract

Background: Physical therapy improves prognosis reduces stay and is generally helpful in aiding recovery from a wide range of ailments. Nontreatment rates occur for multiple reasons and are also related to the personalities of physical therapists.

Methods: We used data from a research project involving physical therapy at an acute care facility in our community. Our study focused on the retrospectively determined primary physical therapist for each patient. We used the chi-squared tests to compare nontreatment rates between days of the week and disease type and the reasons for nontreatment events. Repeated-measure models were used to evaluate the effect of personality on the occurrence of nontreatment events after controlling for other covariates. These were run for every personality trait.

Results: Personality was found to have a statistically significant relationship with nontreatment events. Openness was a significant predictor for nontreatment with the p-value of 0.045 and a slope of B= -0.0694 according to the repeated measurement model. An analysis of nontreatment by day of the week showed a nontreatment ranging from 15.8 and 9.7 with (p-value=.544). The nontreatment rate by diagnosis ranged from 21.2% to 7.1% (p-value<.069). Refusal to participate was the primary reason given for the nontreatment of patients (p-value<.001).

Conclusions: Therapist personality (openness) has a statistically significant relationship with nontreatment. Though our research evaluated personalities relationship with treatment rates, its effect on quality of care could be better understood. More research should be conducted on various aspects of personality and the therapist's patient alliance.

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Introduction

Physical therapy is known to be highly beneficial for the recovery of patients from many conditions, potentially reducing the length of stay and overall recovery time in an acute care setting. According to a review of 32 studies while physical therapy generally had positive effects individual experience did vary dramatically with some patients reporting negative experiences such as disempowerment, boredom, frustration, and personal goals not reflected in therapy (Luker 2015). A review of 1600 spinal patients found a dramatic difference in outcomes between patients who did and did not receive therapy with a 92% vs 52% recovery rate (Chen 2014). The nature of care received during physical therapy and the completion of the course of treatment are essential ingredients for optimal outcomes.

A similar study Physical therapy Nontreatment Events in the Acute Hospital Setting: A Descriptive Study (Young D. 2015) examined the second scheduled physical therapy sessions. This study found a non-treatment rate of 15.04% for all such sessions. When examining the reason for nontreatment the study found that 39% of nontreatment events were for unknown reasons with 26% for a medical condition, 15% Patients' refusal to participate and 11% reported insufficient staffing. Therapists had nontreatment rates Between 0% and 20% while a massive 37.9% did not have a known therapist. Days of the week were analyzed with Sunday having the highest rate of nontreatment 26.26% and Tuesday the lowest at 6.98%. This low rate may have been because of a reduction in therapist hours on the weekend. Nontreatment rates by diagnosis varied from 22.69% to 7.23%.

Another study Predictors of Physical Therapy Non-Treatment Among Patients Scheduled for Treatment Two Times a Day In the Acute Hospital (Bookout S. 2017) which found gender

diagnosis, day of the week, and age all had a statistically influenced nontreatment rates. The study found that women attended both therapy sessions at a higher rate with 84% of females attending both sessions while Males only had a rate of 64%. Tuesday and Thursday had the best rates of non-treatment at only 4.2% for scheduled visits. Those that did not show up for either therapy session was on average younger than those that showed up for both at 55.42 years old vs. 63.89 years old respectively. Those with musculoskeletal disease were found to have the highest rate of full therapy attendance.

In this project, we examined the most recent data set with a new population as part of the same series of studies as Young et al (2015) and Brookout et al (2017). For our study, we replicated some of the observational tests carried out by young et al (2015) with a new data set. This included measurement by count of age characteristics and diagnosis, nontreatment rates by diagnosis and reason for non-treatment. We used a data set from later which also included personality scores associated with each therapist based on the big 5 model. Our primary research questions were based on the influence of primary therapists and their personalities on the rates of nontreatment.

The big five uses a continuum across five dimensions of personality. These include extroversion to introversion, agreeableness to antagonism, conscientiousness to lack of direction, neuroticism to emotional stability, and openness to closedness. As defined by openness or closedness to new experiences people, situations, etc. The test which was administered for measuring these traits is from the Big-Five Trait Taxonomy: History measurement and theoretical perspectives John et al (1999) and forms the basis for the five-dimensional personality analysis we will be conducting.

Conscientiousness as a personality trait relates to dependability and a tendency to seek achievement (Neal 2012). Tett and Burnette (2003) argued that the personality type was associated with things like precise work and rule compliance; however, it was more associated with proficiency than proactivity and adaptivity. It has been found that more neurotic individuals tend to have higher conscientiousness and are more likely to perceive stress (Sur 2014). According to John et al (1999) trait conscientiousness is associated with the descriptors of efficient, organized, not careless, thorough, not lazy, and not impulsive.

As physical therapy requires consistent regular effort trait conscientiousness could prove useful for outcomes but may have a more complicated effect on non-treatment rates. Does, for example, this dependability encourage those involved to attend their scheduled treatments or, is the associated inflexibility a discouraging factor? One might also consider institutional policies a proportionately larger factor when conscientious therapists are involved as opposed to a less conscientious therapist.

Extraversion as a personality trait involves a tendency to be sociable and assertive. Those with extraverted personalities build relationships, energy, teamwork, and cohesion (Neal 2012). This trait is likely "cued" or called upon when persons are required to work in a team (Tett 2003). According to Neal (2012) studies of extroversion found no association with job performance but this was thought to be due to the wide range of tasks that were analyzed in the examined studies. According to John et al (1999) trait, extraversion is associated with the descriptors of sociable, forceful, energetic, adventurous, enthusiastic and outgoing.

The duties of a physical therapist have a large social component. Particularly involving the motivation of patients, it is likely that this personality trait will be helpful both for rates of non-treatment and outcomes. The ability of extroverts to engage with people and form cohesive

teams while bringing energy to the situation is likely to encourage the patient. They also may be able to communicate more effectively what is required for a successful outcome. While extroversion does have mixed effects in professions at large it seemed likely to be beneficial in the therapeutic setting if this sociable nature does not somehow distract from something critical.

Agreeableness as a personality trait tends toward cooperation, courteousness, and tolerance. Agreeable persons are also likely to conform to group norms and may be less likely to be proactive (Neal 2012). According to John et al (1999) trait agreeableness is associated with the descriptors of forgiving, not demanding, warm, not stubborn, not prone to show-off and sympathetic.

Agreeable therapists may be more likely to be supportive rather than demanding which we believed may increase treatment rates. A higher degree of patience and sympathy with patients is also likely to be helpful during the often-arduous task of physical recovery and therapy. A cooperative tendency is likewise helpful for social interactions. On the other hand, an agreeable therapist's eagerness to conform with norms and likely less proactive nature may be counterproductive. It was thought could lead to less being accomplished during sessions and maybe a higher rate of nontreatment as a result. Further, Agreeable therapists were thought to be less likely to push the issue.

Neuroticism as a trait is described as a tendency towards negative cognitions, intrusive thoughts and emotional reactivity (Neal 2012). It has been found that more neurotic individuals are more likely to perceive stress (Sur 2014). Neil et al (2012) found that neuroticism had a statistically significant negative association for all the situations they studied which included the factors of proficiency, proactivity, and adaptivity in individual and group conditions. According

to John et al (1999) the trait neuroticism is associated with the descriptors of tense, irritable, not contented, shy, moody, and not self-confident.

Neuroticism with its associated shyness and lack of self-confidence likely will correlate negatively with rates of treatment. The negative emotions associated with this trait may make patients less likely to attend therapy sessions and may have a deleterious effect on the therapists' overall efficacy. Caution is also associated with neuroticism. Caution with severe medical conditions is not necessarily a bad thing and may at least mitigate some of the negative effects of this personality trait.

Openness as a personality trait relates to an individual's creativity and a preference for new experiences. It may also be associated with flexibility in dealing with new situations and tasks (Neal 2012). According to John et al (1999) openness is correlated with being curious, imaginative, artistic, having wide interests, being excitable and unconventional.

Openness to experiences may influence nontreatment rates by several factors. Flexibility and creativity may help find unique ways of encouraging patients and in dealing with the unique situations inherent in treating people with a variety of ailments. Individuals high in this trait might be more likely to create an engaging environment that may be helpful for non-treatment rates specifically. However, this will probably not have any effect when situations are consistent and repeated (Thoreson 2004), or it conversely might even reduce engagement with tasks they find monotonous.

Essential to our study is our focus on those sessions which involve the primary physical therapist. For our study, the primary therapist is the therapists with which the patient had the most scheduled sessions. These are the professionals who are most responsible for setting the

pace, quality, and routine of the patient's treatment. As such these individuals likely had a disproportionate effect on non-treatment as well as the overall experience of the patient and things like the patient's "buy-in" to the process of treatment and overall progress.

Hypothesis

Our null hypothesis was that the primary therapist personality had no statistically significant association with the occurrence of nontreatment events. Our alternative hypothesis was that primary therapist personality had a statistically significant effect on the occurrence of nontreatment events. We did this by examining which, if any, personality traits did or did not influence whether nontreatment events occurred. We further made some observations of our data set along with some limited comparisons with previous studies at this location. As we observed these changes, we note the new population of patients in our data set. Critical to any comparisons is our retrospective selection of primary therapists in this study. Because of the probable magnitude of change that this selection had, it is likely the principal source of many changes observed between this and previous studies.

Methods

Data

This project is related to the study conducted by Young et al (2015); In that, the data was collected from the same hospital as part of a continuing effort to better understand the causes of nontreatment and discover ways to reduce these events. We had data that was collected from a new population with additional metrics. These included the personality metrics which are central to our paper. This paper also differs from that one because all data was subject to a retrospective selection criterion based around primary physical therapist.

Retrospective data was gathered from a 454-bed suburban hospital in the southwest. This facility had a physical therapy staff of full-time therapists, therapists paid per day, full-time therapy assistants, and full-time aids. In the previous study, therapists worked for 20% to 30% fewer hours on weekends. Significant effort was made to reduce this anti weekend bias which is likely reflected in our data. While the study had 1084 patients in Young et al (2015) our new data set will involve 522 patients. Physical therapists' sessions were the only ones included.

The lead physical therapist directly organized physical therapy sessions and services at the beginning of each day. These were obtained by electronic referrals from each of the nursing units. Physical therapists were typically assigned 8 patients per day for both treatment and evaluation. The therapists themselves organized their exact patient schedules. A paper card was used to track each patient and was not part of the patients' medical records. Notes on the card included the patients' demographic information, diagnosis, evaluation, and goals. The back of the card contained information about the patient's daily care. While the therapists were

encouraged to keep the cards up to date the medical record was the ultimate and only complete location for patient information. The card did not contain everything in the medical record.

Data collection methods

The members of the research team were not affiliated with the hospital but instead were UNLV staff including one faculty member and 2 graduate students. This research team did all the data extraction, analysis and manuscript preparation associated with Young et al (2015) which was used to provide the data for this study. While the hospitals lead physical therapist provided the information on the processes and procedures used on site they did not participate in the extraction, analysis, and manuscript preparation.

The team was not allowed to access medical records by the hospital's risk management department but could use the therapists' handwritten cards which were previously collated and were used in this study. If the documentation did not clearly separate sessions that occurred on the same day the associated patient was excluded.

When the therapists documented the reason for nontreatment was recorded the therapist did not always give a reason for a given session's nontreatment. When this occurred, it was designated as "unknown." When the patient clearly chose not to participate "refusal" was used. When the session was canceled because of their medical conditions or a medical hold was placed on the session because of their condition "medical condition" was used. "Scheduling conflict" was used when the patient had another test or treatment scheduled at the time of the appointment. "Insufficient staff" was used for periods of high patient load when the therapist did not have enough time to see all their patients. Other categories used were "already discharged" and "patient death." The primary medical diagnosis determined the variable "patient diagnosis". If

there were several conditions listed the condition the research team believed was most likely the cause of the patient's condition was used. If it could not be determined it was classified as "other."

Personality was measured using the five factor or OCEAN model. To determine the OCEAN personality score, a self-reported personality inventory was conducted using the questions shown in Appendix 1. This data was then used to calculate the personality score we used in our analysis based on the equations shown in Appendix 2. This score was then be used to run a repeated measurement model regression with nontreatment being the dependent variable and the OCEAN scores being the independent variables. Then the variable's openness, conscientiousness, extroversion, agreeableness, and neuroticism were tested against the $p<.05$ research standard.

Data analysis

We looked at the participation rate by the day of the week for all the physical therapy sessions scheduled with the primary therapist. Ideally, treatment would be consistent throughout the week to ensure the best possible outcomes for patients; without regard for the time of admission or patients' evolving schedules. The world is however not ideal, so observing the weekly pattern of non-treatment might have allowed us to see factors that affected rates of treatment as well as observe areas where hospitals might improve.

We observed nontreatment rates by diagnosis for all the physical therapy sessions scheduled with the primary therapist. While therapy is desirable for many acute care diagnoses the necessity of each does vary. Also, the experienced stress and difficulty associated with treating every ailment (not to mention every case of that ailment) are likely to have been unique.

The care they had been receiving from their principal therapists is of the utmost value in determining how they faced these challenges and if they continued to seek the treatment that they may have needed. This study focused on those sessions allowing us to see these effects in greater detail and thus inform future research and potential treatment.

We observed the age characteristics of those with each diagnosis and the associated rate of nontreatment for each diagnosis for sessions scheduled with the patient's primary therapist. As before noted, each diagnosis brings its challenges and import. Furthermore, different age groups are prone to different ailments and different rates of nontreatment. By observing these rates, we were able to parse which diagnosis was receiving or not receiving physical therapy and the age group most associated with the ailment. Different age groups are also likely to have different non-treatment rates due to higher or lower rates of professional and personal commitments. A person just barely in pre-retirement is likely to have responsibilities at a rate far different than an individual only a few years older. As the primary factors for non-treatment are likely to be the same for our new population and the effects of age on disease are likely to still be close to the same, we did not anticipate a large change in our study when compared to Young et al (2015) on those principals. However, as we focused on sessions with the primary therapy, we suspect that this will be the major reason for changes observed in our study.

We summarized the reasons for non-treatment for all the physical therapy sessions scheduled with the primary therapist. Not every reason for non-treatment is equal. Many times, scheduling conflicts arise, surgery or essential testing is likely to be more expedient than physical therapy at a given time. Medical conditions may interfere with physical therapy making it unsafe. Patient refusal may be due to a patient not seeing the benefit of therapy or disliking the prospect of therapy too much to attend. The patient may also already be discharged, already

treated, dead or unable to participate for an unknown reason. Regrettably, the hospital may have insufficient staffing to meet the patient's needs. Clearly, the primary therapist may not be able to influence all of these, but a competent therapist might have some effect on patient refusal if they can make good progress with the patient and get them to engage. While not necessarily always able to help directly, a more organized therapist might influence the time of subsequent sessions to ensure the patient is there at a time they are more likely able to receive therapy. By including this variable, we can get a general idea of those non-treatment events which are likely out of the therapists' hands and those which might be more of an administrative issue.

We calculated the nontreatment rate for each therapist for all the physical therapy sessions where the sessions were scheduled with the patient's primary therapist. Through this, we can observe the variation in success between primary therapists. This allows us to see the influence the therapists have on non-treatment at a higher resolution since we are only looking at those with whom they were the primary or mode therapist. While Young et al (2015) looked at this metric for every second scheduled session ours looked at multiple sessions. This introduced complexity to our analysis due to repeated measures but was necessary for adequately examining the effect of therapist personality on nontreatment.

A retrospective review was conducted based on the primary physical therapist associated with each patient. To accomplish this, all visits that do not involve the primary therapist were removed. The primary physical therapist was defined as the mode therapist. When multiple therapists have treated a patient an equal number of times, one of the was randomly selected as the primary therapist. When no primary therapist could be determined the therapist was randomly selected from among the "tied" therapists. Visits with an unknown therapist were removed.

To exclude those with only one appointment all first appointments were removed. This was also to simplify the data and eliminate incomplete entries the first visit was eliminated in the data. The first visit was also fundamentally different from subsequent visits as this was the session of assessment. The first visit was still be used to determine the primary therapist. The primary therapist was selected by mode. Visits with an unknown therapist were eliminated. Analysis of therapist personality and nontreatment was examined by regression to determine the OCEAN personality score a self-reported personality inventory was conducted using the questions shown in Appendix 1. This data was then used to calculate the personality score we used in our analysis based on the equations shown in Appendix 2. This score was then used to run a regression with nontreatment being the dependent variable and the OCEAN scores being the independent variables. Then the variable's openness, conscientiousness, extroversion, agreeableness, and neuroticism were tested against the $p<.05$ research standard.

Repeated measures such as with the same patient or therapist will tend to be more correlated with each other than truly independent measures and this relationship needs to be considered in the analysis which makes simple linear regression unsuitable. That is why this was a clustered repeated-measure study. This study had three levels of structure: visit as the first level, patient as the second level, and therapist as the third level. The second level factor was nested within the third level, and the first level was a repeated factor within the second level. In practice, a patient could be treated by other therapists in addition to his/her primary therapist. For this reason, the correlation of patients from the same therapist may not be as strong as the case that a patient only visited by their primary therapist. Therefore, we considered two repeated-measure models to analyze this data: Model-1 that only considered the dependence of outcomes

from the same patient; and level-2 that considered both the correlation of patients within therapist and the correlation in level-1.

Data analysis for this study used IBM SPSS 25 and SAS 9.4. In these two models, the following demographic data of patients and therapists were included: age and gender of patients, and age and gender of therapists as well as medical diagnosis, and day of the week. These were always included in our repeated-measure models. For Model-1, we first fitted repeated-measure models for each personality factor with the binary nontreatment events as the outcome after controlling for the six covariates. We ran 5 separate repeated-measure models one for each personality factor which we considered.

Results

There were 522 patients included in the data analysis (N_p =522), with a total of 918 scheduled physical therapy sessions. We had 34 primary therapists from the study (N_t=34). Therapists averaged 15.35 patients each after our selection criteria. Therapists also averaged 27 sessions see (appendix 3). From this, it can be assumed that therapists typically had relatively few sessions included in our analysis with any one patient. As we had included the first session in primary therapist selection but not in the analysis that selection is likely more valid than this information might suggest. However, more sessions with each patient would be desirable in an analysis of the effect of therapist personality on nontreatment.

Table 1: **Demographic Statistics for Patients and Therapist**			
	Patients	Therapists	P-value
	N=522	N=34	
Age (SD)	71 (16)	40 (7)	<0.001
Women (%)	297 (56%)	12 (35%)	<0.001

Demographic statistics for patients and primary therapists are shown in Table 1. The average age of patients was 71. (SD=16, range=17-99), while therapists were much younger in general with the mean of age as 41. (SD=7, range 27-54). Age difference between patients and therapists was significant by the chi square test of significance (p-value<0.001). Among patients, the proportion of women was 56.9%. This was much lower among therapists (35.2%). Comparing these proportions by chi square test of significance gives us a p-value of less than 0.001.

Table 2 **Additional Therapist Demographics**	
Therapist Race/Ethnicity	%
Hispanic/Latino	3.1%
Asian/Pacific Islander	40.6%
Italian	3.1%
African American	9.4%
White	43.8%
Therapist degree	
Associates	21.9%
Bachelors	21.9%
Masters	9.4%
DPT	46.9%

Additional demographic data for therapists are included in table 2. The most common racial/ethnic identity for physical therapists in our study was White at 40.6% followed closely by Asian and Pacific Islander at 43.8%. The least common were Italian and Hispanic/Latino both at 3.1%. The most common level of education was by far Doctor of Physical Therapy at 46.9%. With Master's degrees being the least common 9.4%

Table 3
Age Statistics by Diagnosis

	Age			
Diagnosis	Mean	Min	Max	Standard Deviation
Musculoskeletal	72	28	93	15
Renal	72	48	92	13
Pulmonary	76	37	97	11
Cardiovascular	77	41	97	11
Neurological	71	37	97	14
GI	62	17	87	18
Cancer	63	27	91	17
Other	70	27	93	19

We measured age characteristics of the patients and their diagnosis for sessions scheduled with the patient's primary therapist. This was measured in custom tables in SPSS. See (Table 3) Average ages by diagnosis ranged from 62 for gastrointestinal diagnosis to 77 for cardiovascular. Standard deviations ranged from 11 to 19. The youngest age was observed for gastrointestinal at 17. The oldest average was 97 with pulmonary, cardiovascular, and neurological having persons of that age. Duplicate patients were eliminated for this table, so these were not the same patient unless some serious error gave the same patient different anonymizing identification numbers earlier in the process.

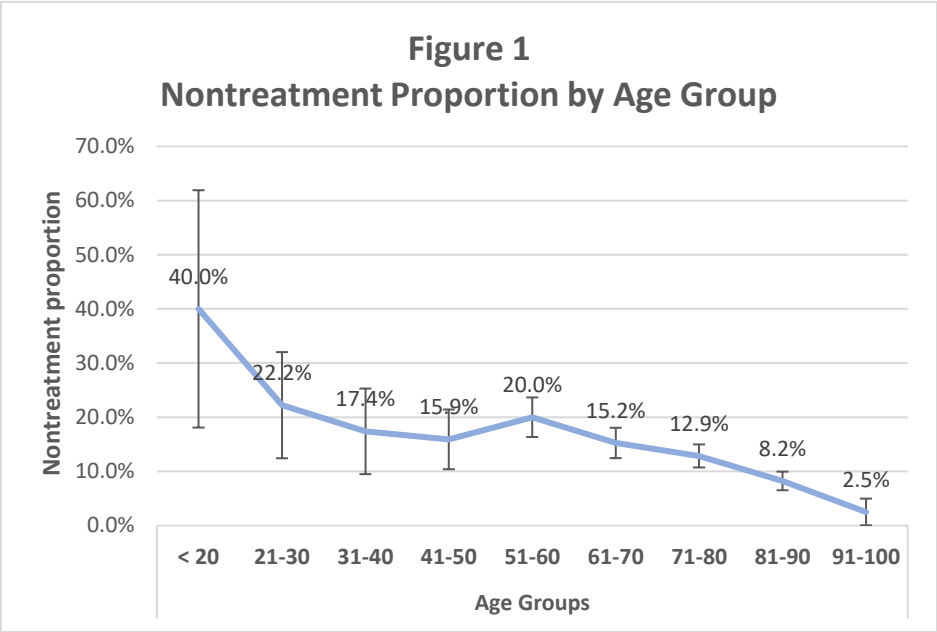
Table 4					
Age Characteristics and Diagnosis					
		Age			
Diagnosis	Participate	Mean	Min	Max	Standard Deviation
Musculoskeletal	Yes	72	28	93	16
	No	71	44	91	14
Renal	Yes	74	48	92	12
	No	59	50	76	12
Pulmonary	Yes	76	37	97	11
	No	74	54	88	11
Cardiovascular	Yes	76	41	97	11
	No	71	41	90	12
Neurological	Yes	72	39	97	15
	No	63	37	86	12
GI	Yes	64	17	87	18
	No	52	20	85	20
Other	Yes	71	27	93	19
	No	66	30	86	20
Cancer	Yes	66	32	91	15
	No	56	27	78	17

Table 4 contains similar information to table 3 but breaks it further into treatment and nontreatment subgroups. This table also uses all sessions rather than selecting for patient as was done for table 3. Table 4 shows that the average age for nontreatment for all diagnoses was lower than for sessions were the patient participated. Despite the difference in selection most statistics are similar for both tables with similar standard deviations and averages and the same maximum and minimum ages.

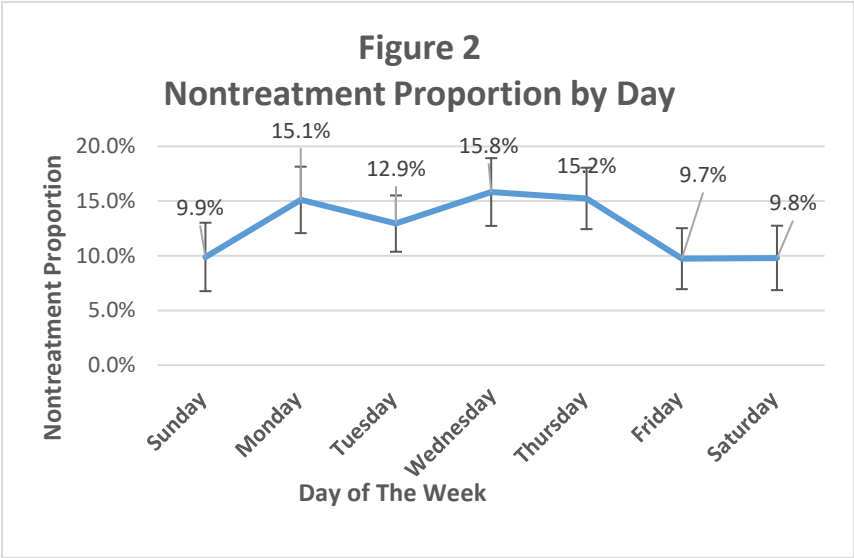
Table 5
Top and Bottom Therapist Participation %

Therapist ID	Participate		Total	Nontreatment %
	Yes	No		
18	5	5	10	50%
14	14	6	20	30%
16	7	3	10	30%
2	3	1	4	25%
33	3	1	4	25%
.....				
30	1	0	1	0%
32	1	0	1	0%
42	4	0	4	0%
44	2	0	2	0%
45	2	0	2	0%
Total	798	120	918	13%

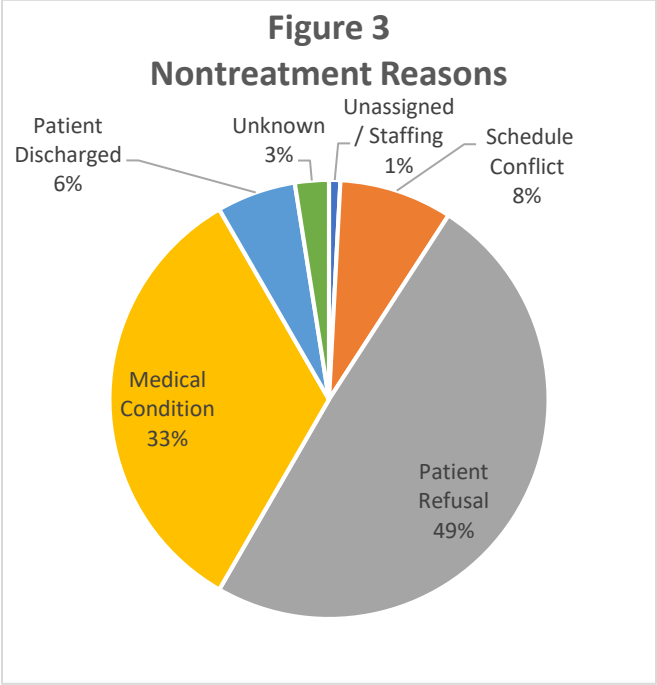
Participation proportions by therapist were contained in table 5. This is only the 5 highest and lowest nontreatment rates. A complete table is included in appendix 4. We see that the average nontreatment rate for all therapists were 13%. Nontreatment proportions experienced by therapist ranged from 50% to 0%.



Nontreatment proportions for each age group are shown in Figure 1. The proportion of nontreatment falls dramatically with patient age except for patients between the ages of 41 and 70 where we observed a slight increase. It should be noted that while the proportion of nontreatment visits did fall with age, nontreatment events increased in patients 50 to 90 in absolute terms. These patients accounted for a far larger share of all visits, including nontreatment events than any other age groups we examined. Standard error varied significantly between age groups largely due to the relative lack of younger participants.

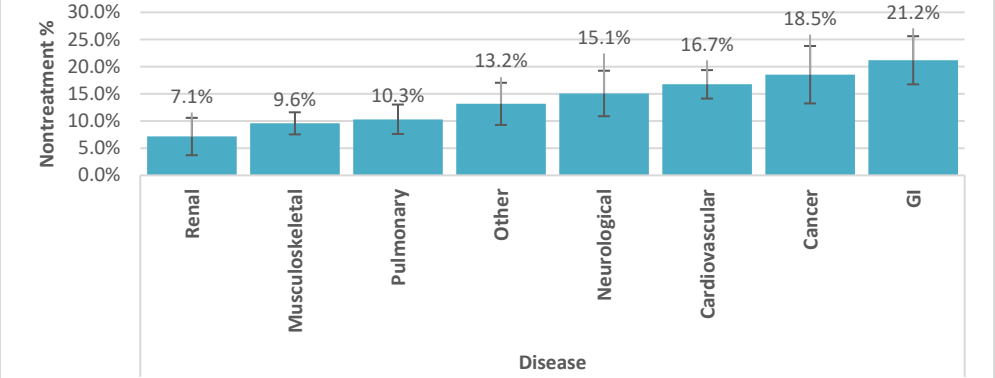


Nontreatment proportions by day of the week are shown in Figure 2. Weekdays from Monday to Thursday had higher nontreatment proportions. While nontreatment proportions on weekends and Friday were lower. Nontreatment varied between 15.8 and 9.7 over the week. Standard error varied little throughout the week with the standard error falling from 2.6% to 3.1%. An analysis of the Chi-squared gave us a significance of (p-value=.544).



The pie chart in Figure 3 reflects the proportion of nontreatment events associated with each reason for nontreatment given by the therapist. The largest reason for nontreatment was patient refusal followed closely by difficulties associated with a medical condition. When taken together these two reasons accounted for over 80% of all nontreatment events. An analysis with the Chi-squared gives us a significance of (p-value$<.001$).

Figure 4
Nontreatment by Diagnosis



Nontreatment for each patient diagnosis group is shown in figure 4. The highest proportion of nontreatment was observed in patients with a gastrointestinal diagnosis followed closely by cancer. Patients with either gastrointestinal had nontreatment in 21.2% of scheduled sessions. Patient with musculoskeletal and or renal diagnosis had the lowest proportion of nontreatment with both being below 10%. With renal having the lowest proportion at 7.1%. An analysis with the Chi-squared gives us a significance of (p-value<.069).

Table 6 **Results of Level 1 Model**	
	p-value
Openness	0.0447
Extraversion	0.1374
Agreeableness	0.4696
Conscientiousness	0.4913
Neuroticism	0.7106

Repeated measure models yielded a significant result regarding therapist personality. The findings indicated that openness was a significant predictor for nontreatment with (B= -0.0694, SE=0.0345 p-value= 0.045) using the level 1 model. The p-values for each of the traits evaluated are shown in table 6. Therapists having a higher score of openness were more likely to have a lower proportion of nontreatment. The other four personality factors were not found to be significant predictors for nontreatment rates. The second most significant factor in our analysis was Extraversion. However, this failed to meet the p=.05 standard for either model, thus was not found to be significantly associated with nontreatment.

When the level-2 model was used to fit the data by assuming that patients were only visited by their primary physical therapist openness was not a significant predictor (B= -0.0743, SE=0.0465, and p-value=0.1217). Openness had the strongest association with nontreatment among the five personality factors.

Discussion

The attitude and aptitude of the therapists interact with many dimensions of the entire process. For this reason, the therapist's personality is likely to play a key role in nontreatment outcomes. A standard tool in psychometrics to examine personality is the big 5 model. An individual's personality as described by the five-factor model reflects their approach to others and toward problems. This relationship is likely reflected by the brain volume correlation observed in a study of MRI scans (Kapogiannis 2012). Association based psychological examination of personality types goes back at least to the late 19th Century (John 1999). This has been refined through a century of research, selection, combination, and elimination. This process has yielded the Big 5 Model which is currently used widely in the fields of psychology and sociology (John 1999). While further refinement is being attempted it is arguably the best tool available for our purposes.

In previous studies, nontreatment had been higher on weekends (Young 2015, 2016). Since those studies were conducted, staff scheduling was altered to increase the presence of regular staff on weekends. The change we observed in our current study would be consistent with the desired effect of those changes as weekends had much higher rates of treatment than previously observed. This could also be the result of our current study's selection methodology. Since only sessions with the primary physical therapists were included, we would tend to select for regular staff and thus directly reduce the effect that part-time staff had on our observations. Both effects likely contribute to what we observed.

In our study, the highest proportion of nontreatment was observed in patients with a gastrointestinal diagnosis. With these patients having a nontreatment rate of 21.2% (see Figure 4). While in a previous study it was measured at 17.2%. In that study, a pulmonary diagnosis

had the highest rate of nontreatment at 22.7%. This is compared to pulmonary diagnosis being associated with a nontreatment rate of 10.3 % in our current study (see Figure 4). We suggest that such inconsistencies in our observations are due to diagnosis and nontreatment having an unstable relationship. This relationship is likely influenced by occurrences outside of the physical therapy department. Patient participation dropped with age except for patients 51-60. While the nontreatment rate for younger patients is much higher, the fact that patients in the 51-60 range were so much more numerous may make them a desirable group to target.

Openness had a statistically significant correlation with lower rates of nontreatment in level 1 when data was considered within patients but not within level 2 when data was considered within therapists (B= -0.0694, SE=0.0345 p-value= 0.045). This suggests interaction between therapists in terms of nontreatment. As gender differences are known to have an association with personality (Costa 2001) this may have also reduced the significance of our findings.

Even with this our data still suggests that the personality of the attending therapist influences patient refusal. While it is impractical to change one's personality, the success of more open physical therapists may suggest that this approach to therapy and patient-therapist interactions will encourage patient participation. This is important as the largest reason for nontreatment was patient refusal.

We suggest that several attributes of more open therapists may prove helpful in encouraging patient participation in sessions and encouraging the patient-therapist alliance in general. The attributes of flexibility and creativity may help these therapists find effective techniques for helping patients. This was likely associated with adjustments to technique on a patient by patient basis. It seems likely that patients benefit from a tailored approach from even

the first moments of each session. If it is not necessarily tailoring but simply new approaches that encourage these outcomes these new techniques may be more easily scaled, especially among the conscientious (Neal 2012).

Conclusions

Examination of the data showed that therapists' rate of nontreatment with patients varied widely from perfect participation from all their patients to a 50% rate of non-treatment. An analysis of nontreatment by day of the week showed a far milder disparity ranging from 15.8% on Wednesday to 9.7% on Friday. While nontreatment by diagnosis ranged from 7.1% for renal diagnosis to 21.2% for gastrointestinal diagnosis. Refusal to participate was the primary reason given for the nontreatment of patients throughout the study. This accounted for 49% of nontreatment events.

Therapist personality had a statistically significant relationship with nontreatment. Openness was found to be the most significant with a p-value of ($p=0.0447$) a slope of ($B= -0.0694$) and a standard error of ($SE=0.0345$). Openness was found to reduce the occurrence of nontreatment, and we suggested this was because of the associated traits of creativity and flexibility. Openness was found to be significant in the level 1 models which accounted for repeated measures in patients but not in level 2 which accounted for repeated measures with therapists. While we were able to confirm a relationship between personality and treatment events, other dimensions of quality of care were not evaluated and may be a desirable subject for future research.

Non-treatment is associated with important attributes of patient and therapist and the matches between the two. More work is needed to understand these relationships and guide hospital staffing and patient assignments. Due to its possible relationship with the data and the observations made by department of physical therapy students involved in the research, the effect of gender matching between therapist and patient should be the subject of future research. We also have the fundamental question of patient refusal and non-treatment to continue to address.

According to the National Institutes of Mental Health (2020), 7.1% of the general population experienced a major depressive episode within the last year. This is likely to only be higher in an acute care setting and may be a factor worth examining in future research of nontreatment.

Limitations

The personality test was a self-reported inventory and as such could result in a subjective reporting bias. Despite the OCEAN model being on a "continuum", the base data associated with this personality test uses a Likert scale that provides ordinal significance but lacks the resolution of an interval. As all data has been collected from one hospital it may not be generalizable to other regions or even other facilities. For example, if adherence to a set of standards present at this hospital is particularly helpful or deleterious to outcomes, consciousness becomes a far more important trait. As the card system was a secondary method of record without researchers having the opportunity to verify with the patients' medical records unintentional inaccuracies may have been introduced. The small number of therapists (34 after initial selections) also limits our findings statistical significance and generalizability. This number of therapists also divides sessions substantially and may limit the practical significance of our findings. Our study's selection of only sessions held with the "primary" therapist must also be considered when comparing our results to other studies. While our selection method is justified in our study, it does not seem to be common to any other that we have found. Personality and sex may have had statistical interactions that reduce the significance of our findings for some personality traits when we analyzed them.

Appendix

Appendix 1 **Inventory Questions**		
variable	Question/Description	Answer Choices
Big five inventory #1 BFI_1	Is talkative	1= Disagree Strongly 2= Disagree a little 3=Neither agree or disagree 4=Agree a little 5= Agree strongly
Big five inventory #2 BFI_2	Tends to find fault with others	
Big five inventory #3 BFI_3	Does a thorough job	
Big five inventory #4 BFI_4	Is depressed, blue	
Big five inventory #5 BFI_5	Is Original, comes up with new Ideas	
Big five inventory #6 BFI_6	Is reserved	1= Disagree Strongly 2= Disagree a little 3=Neither agree or disagree 4=Agree a little 5= Agree strongly
Big five inventory #7 BFI_7	Is helpful and unselfish with others	
Big five inventory #8 BFI_8	Can be somewhat careless	
Big five inventory #9 BFI_9	Is relaxed, Handles stress well	
Big five inventory #10 BFI_10	Is curious about many different things	
Big five inventory #11 BFI_11	Is full of energy	1= Disagree Strongly 2= Disagree a little 3=Neither agree or disagree 4=Agree a little 5= Agree strongly
Big five inventory #12 BFI_12	Starts quarrels with others	
Big five inventory #13 BFI_13	Is a reliable worker	
Big five inventory #14 BFI_14	Can be tense	
Big five inventory #15 BFI_15	Is ingenious, a deep thinker	
Big five inventory #16 BFI_16	Generates a lot of enthusiasm	1= Disagree Strongly 2= Disagree a little 3=Neither agree or disagree 4=Agree a little 5= Agree strongly
Big five inventory #17 BFI_17	Has a Forgiving nature	
Big five inventory #18 BFI_18	Tends to be disorganized	

Big five inventory #19 BFI_19	Worries a lot	
Big five inventory #20 BFI_20	Has an active imagination	
Big five inventory #21 BFI_21	Tends to be quiet	1= Disagree Strongly 2= Disagree a little 3=Neither agree or disagree 4=Agree a little 5= Agree strongly
Big five inventory #22 BFI_22	Is generally trusting	
Big five inventory #23 BFI_23	Tends to be lazy	
Big five inventory #24 BFI_24	Is emotionally stable, not easily upset	
Big five inventory #25 BFI_25	Is inventive	
Big five inventory #26 BFI_26	Has an assertive personality	1= Disagree Strongly 2= Disagree a little 3=Neither agree or disagree 4=Agree a little 5= Agree strongly
Big five inventory #27 BFI_27	Can be cold and aloof	
Big five inventory #28 BFI_28	Perseveres until the task is finished	
Big five inventory #29 BFI_29	Can be moody	
Big five inventory #30 BFI_30	Values artistic, aesthetic experiences	
Big five inventory #31 BFI_31	Is sometimes shy inhibited	1= Disagree Strongly 2= Disagree a little 3=Neither agree or disagree 4=Agree a little 5= Agree strongly
Big five inventory #32 BFI_32	Is considered kind to almost everyone	
Big five inventory #33 BFI_33	Does things efficiently	
Big five inventory #34 BFI_34	Remains calm in tense situations	
Big five inventory #35 BFI_35	Prefers work that is routine	
Big five inventory #36 BFI_36	Is outgoing, sociable	1= Disagree Strongly 2= Disagree a little 3=Neither agree or disagree 4=Agree a little 5= Agree strongly
Big five inventory #37 BFI_37	Is Sometimes rude to others	
Big five inventory #38 BFI_38	Makes plans and follows through with them	
Big five inventory #39 BFI_39	Gets Nervous easily	
Big five inventory #40 BFI_40	Likes to reflect, play with ideas	
Big five inventory #41 BFI_41	Has few artistic interests	1= Disagree Strongly 2= Disagree a little

Big five inventory #42 BFI_42	Likes to cooperate with others	3=Neither agree or disagree 4=Agree a little 5= Agree strongly
Big five inventory #43 BFI_43	Is easily distracted	
Big five inventory #44 BFI_44	Is Sophisticated in art music, or literature	

Appendix 2 **Personality equations**	
Personality Trait (Big Five)	equation
Extraversion	n= (BFI 1+BFI 6 R + BFI 11 + BFI 16 + BFI 21R + BFI 26+ BFI 31R+ BFI 36)
Agreeableness	n= (BFI 2R + BFI 7 + BFI 12R BFI 17 + BFI 22 + BFI 27R + BFI 32+ BFI 37R+ BFI 42)
Conscientiousness	n= (BFI 3 + BFI 8R + BFI 13 + BFI 18R + BFI 23R + BFI 28+ BFI 33+ BFI 38+ BFI 43R)
Neuroticism	n= (BFI 4+ BFI 9R+ BFI 14+ BFI 19+ BFI 24R+ BFI 29+ BFI 34R+ BFI 39)
Openness	n= (BFI 5+ BFI 10+ BFI 15+ BFI 20+ BFI 25+ BFI 30+ BFI 35R+ BFI 40+ BFI 41R+ BFI 44)
The equation references questions scores on BFI_1-BFI_44 to calculate an overall personality score n, R denotes reverse-scored items	

Appendix 3
Patients and sessions per therapist

Therapist ID	# Patients	# Sessions
1	36	54
2	3	4
3	5	11
4	25	50
5	53	91
6	34	40
7	35	55
8	54	117
9	17	21
10	17	20
11	32	47
12	24	68
13	11	14
14	13	20
15	20	38
16	6	10
17	4	4
18	10	10
19	4	9
20	1	1
21	4	7
22	64	141
23	4	6
25	1	1
26	1	1
28	11	19
29	1	1
30	1	1
32	1	1
33	4	4
34	18	44
42	4	4
44	2	2
45	2	2
Average	15.35	27

Appendix 4
Therapist ID Participation

Therapist ID	Participate		Total	Nontreatment %
	Yes	No		
18	5	5	10	50%
14	14	6	20	30%
16	7	3	10	30%
2	3	1	4	25%
33	3	1	4	25%
12	52	16	68	24%
9	17	4	21	19%
8	96	21	117	18%
5	75	16	91	18%
1	45	9	54	17%
6	34	6	40	15%
4	43	7	50	14%
19	8	1	9	11%
28	17	2	19	11%
3	10	1	11	9%
34	40	4	44	9%
11	43	4	47	9%
15	35	3	38	8%
22	132	9	141	6%
10	19	1	20	5%
7	55	0	55	0%
13	14	0	14	0%
17	4	0	4	0%
20	1	0	1	0%
21	7	0	7	0%
23	6	0	6	0%
25	1	0	1	0%
26	1	0	1	0%
29	1	0	1	0%
30	1	0	1	0%
32	1	0	1	0%
42	4	0	4	0%
44	2	0	2	0%
45	2	0	2	0%
Total	798	120	918	13%

Appendix 5
Therapist Personality Scores

Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
	41	43	12	
29	36	40	8	32
29	41	43	15	39
31	42	41	18	32
23	43	38	19	35
31	41	36	20	39
30	39	43	14	32
23	41	45	24	30
19	27	34	13	37
29	34	38	12	43
34	44	44	16	40
32	41	45	10	39
26	42	39	18	35
31	41	40	27	32
36	42	44	13	42
26	45	44	11	37
33	38	39	14	32
38	45	45	8	30
37	39	43	9	32
26	38	33	17	45
33	34	34	18	39
30	33	40	21	
36	42	34	13	41
40	38	32	17	42
32	33	29	21	33
31	42	36	17	34
29	35	40	26	31
36	37	42	26	25
27	40	42	17	34
22	40	36	18	39
30	43	42	17	45
22	40	40	21	39

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Curriculum Vitae

sljohnson1776@gmail.com

Education

· BA Economics, University of Las Vegas Nevada 2012

·Finishing MPH degree with a concentration in epidemiology and biostatistics

Work History

· light duty driver AAA roadside assistance driver for Am Pm Towing

My duties included servicing vehicles, selling and inventorying batteries, managing my own schedule and training new drivers.

· Substitute teacher for CCSD

My duties revolved around student management, safety, and teaching.

· Volunteered with Cleveland Clinic Dementia Friendly Nevada program

· Interned with Create a Change

Designed Study and Collected Data from Health Coordinators in Nevada school district

Useful attributes

· Enjoys learning and teaching

·Fluency with statistical program SPSS. Has used PSPP, STATA and SAS.

· Fluency with word and excel.

· Affable

· Good intuitive and scientific reasoning skills with a firm grasp of logic