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Quick returns and night work as predictors of sleep quality, fatigue, work-family balance and satisfaction with work hours

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Abstract

Quick returns (intervals of <11 hours between the end of one shift and the start of the next) are associated with short sleeps and fatigue on the subsequent shift. Recent evidence suggests that shift workers regard quick returns as being more problematic than night work. The current study explored quick returns and night work in terms of their impact on sleep, unwinding, recovery, exhaustion, satisfaction with work hours and work-family interference. Data from the 2006 cohort of Swedish nursing students within the national Longitudinal Analysis of Nursing Education (LANE) study were analysed (N=1459). Respondents completed a questionnaire prior to graduation (response rate 69.2%) and three years after graduation (65.9%). The analyses examined associations between frequency of quick returns and night work and measures taken in year three, while adjusting for confounding factors (in year three and prior graduation). Frequency of quick returns was a significant predictor of poor sleep quality, short sleeps, unwinding, exhaustion, satisfaction with work hours and work-to-family interference, with higher frequency predicting more negative outcomes. Quick returns did not predict recovery after rest days. Frequency of night work did not predict any of the outcomes. In conclusion, quick returns-were an important determinant of sleep, recovery and wellbeing, whereas night work did not show such an association.

Introduction

Quick returns, short intervals (<11h) between the end of one shift and the start of the next, often occur when the individual is scheduled to work an evening shift followed by a morning shift the next day, or is going from night to evening shift or morning/day to night shift (European Parliament, Council of the European Union 2003). They restrict the opportunity for sleeping and other non-work activities between shifts, and are associated with (i) shorter sleeps (Axelsson et al., 2004; Kurumatani et al., 1994), (ii) poor sleep quality (Gieger-Brown et al., 2011) (iii) increased fatigue on the subsequent shift (Tucker et al., 2010; Tucker et al., 2000) and higher prevalence of shift work disorder (Eldevik et al., 2013; Flo et al., 2014). During these short inter-shift breaks, the worker must find time for sleep, food preparation, meal intake, travel to work, personal hygiene and, if possible, family interactions. It is thus highly likely that at least one of these activities will be compromised. Moreover, the opportunity for unwinding and 'detaching' from the work will be limited. This may cause difficulties falling asleep (c.f. Akerstedt et al., 2002), thereby exacerbating the issue of restricted time for sleep. The limited and poor sleep associated with quick returns may be a pathway to poor health as poor sleep has shown associations with a number of symptoms of ill health e.g. burn out (Söderström et al., 2012), diabetes (Anothaisintawee et al., 2015) and cardiovascular disease (Sabanayagam & Shankar, 2010). Another possible pathway to poor health is that the resulting fatigue that is carried over into the next day necessitates the expenditure of additional (compensatory) work effort in order to maintain job performance. Such additional effort further increases the need for recovery, leading to

accumulated load effects and possible subsequent health problems (Geurts & Sonnentag, 2006; Meijman & Mulder, 1998).

Quick returns are a means of compressing the working week, giving longer periods of rest between spans of work days (e.g. Barton et al., 1994). For this reason, quick returns and the shift systems that feature them are often popular with the workforce. However, given their impact on sleep and recovery, ergonomic guidelines usually recommend that they should be avoided and the European Working Time Directive requires that workers be allowed a minimum of 11 hours between successive duty periods. Nevertheless, some groups of workers in certain countries of the EU are exempted from this requirement as a result of local agreements, e.g. in Swedish healthcare, quick returns of around 9 hours are common. Statistics on the prevalence of quick returns are scarce but a Norwegian study showed that 81.2 % of a sample of nurses (n= 1990) reported having quick returns (Eldevik et al., 2013), whereas in a representative sample of Swedish doctors (n=1534) the prevalence was 64 % (Tucker et al., 2013).

A recent survey asked a random sample of all workers that were registered as shiftworkers in Sweden in 2011(309 out of 3483; 58% response rate; 42% working in health care, 10% in manufacturing, 6% retail, 4% transport, 2% police/security and the remainder were mixed/unspecified in the report) which aspect of their work schedules they considered to be a severe problem (Åkerstedt et al, 2012). A total of 38 % of the sample reported having work schedules with quick returns and of those 28% reported it being severe problem. By contrast, only 12% of respondents who worked night (32% of the sample)

considered it to be a problem. Further evidence suggesting that night work may not be as problematic as is sometimes assumed comes from another Swedish survey of shift workers. Akerstedt et al (2008) reported that night shifts were found *not* to be a major source of sleep disturbance, when compared to day workers. Moreover, the night workers' sleep disturbance was low when compared to the problems experienced by insomniac patients.

The current study compares night work and quick returns in terms of their impact on sleep, fatigue, satisfaction with work hours and work-family imbalance in a homogeneous sample of nurses from the Longitudinal Analysis of Nursing Education (LANE) longitudinal cohort study.

Method

Study design and Participants

Data for this study derived from the larger study, Longitudinal Analysis of Nursing Education/Entry in working life (LANE). In the LANE study individual and work-related factors associated with professional development and ill health among nurses were investigated yearly from education and during the first three years of clinical practice (for a more detailed description, see Rudman et al., 2010). Data for the present study derived from a national cohort of registered nurses who graduated from Swedish nursing education in 2006. Nursing students registered in the final semester of undergraduate nursing education were invited to participate. At the time, 26 universities were offering

undergraduate nursing education in Sweden. A total of 2,107 nursing students were eligible for participation in the study. Subsequently, 1,459 (69%) gave their informed consent and constituted the cohort. The response-rate at follow up (i.e. the third year in the profession) was 962 (65.9%) and less than 20 nurses had actively left the cohort.

Data were self-reported and collected by means of a postal survey that were sent to each participant's home address along with instructions for returning them. Informed consent was obtained from every single participant in conjunction with filling in the first questionnaire. The data collections were performed by Statistics Sweden. Approval for the study was received from the Research Ethics Committee at the Karolinska Institute, Sweden (Dnr KI 01-045 [2001-05-14; 2003-12-29]).

The mean age in the cohort at follow-up, 3 years post graduation, was 30.1 years (SD 7.1; range 25-58). Quick returns were measured by the question "how many times per month do you work an evening shift followed by a morning shift?". In total 76.7 percent of participants answered the question, of whom 31.6 percent never had quick returns, 13.8 percent reported having 1-3 quick returns per month, 26.5 percent reported having 4-6 quick returns per month and 28.1 percent reported having more than 6 quick returns per month. The question about how frequently participants worked nights was filled in by 76.9 percent of the sample, of whom 56.4 percent stated that they never worked night, 12.6 percent worked 1-3 nights per month, 15.3 percent worked 4-6 nights per month and 15.8 worked 6 or more nights per month.

At baseline, before entering working life, participants filled in a questionnaire with questions regarding age, self-reported health, sleep quality, gender, type of employment (“permanent employment” vs other), experience of night work prior to graduation (yes / no) and morningness. During follow up, when participants had been working as nurses for 3 years, they answered questions about sleep, unwinding at bedtime, exhaustion, satisfaction with work hours, work to family balance and if they had children in the household.

Measures

For the purposes of the current analyses, all items were coded so that high values reflected what could generally be regarded as a less desirable outcome. The Karolinska Sleep Questionnaire was used to measure the dimensions of sleep quality and unwinding during the past four weeks (Åkerstedt et al., 1994; Åkerstedt et al., 1997). The items included in the sleep quality index were “difficulties falling asleep”, “restless sleep”, “repeated awakenings”, and “premature awakening” (Cronbach’s alpha = .76). The unwinding index comprised the items “difficulty sleeping caused by thoughts of work” and “difficulty to calm down after stressful work day” (Cronbach’s alpha = .67). The responses range from “never” to “most days of the week” (values 1 to 5). Participants were ~~asked also~~ asked to rate how often during the past four weeks that they had sleeps shorter than 5 hours (1- never, 5-almost every day). They also rated if they felt well rested after the weekend or 2 days of time off work (1-very often or always, 5- very seldom or never). Satisfaction with work hours was

measured with the question “how satisfied are you with your work hours?” (1- very satisfied, 4- not at all satisfied).

In order to measure the work to family balance the subscale “Spillover of work to family” from the Work-Family Interface Scale (W-FIS) was used (Curbow et al., 2003). It comprises the questions “It’s hard for me to have fun with my family because I worry about problems at work ”, “Problems at work make it hard for me to relax at home ” and “If things go wrong at work I am hard to get along with at home” (1- to a very low degree, 5- to a very high degree; Cronbach’s alpha =.84).

To measure one of the core dimensions of burnout i.e. exhaustion, items from the Oldenburg Burnout Inventory were used (Demerouti et al., 2001; Halbesleben & Demerouti, 2005). Information on translation of the Swedish version was reported in Dahlin (2007). The 5 items used in this study were; “There are days that I feel already tired before I go to work”, “After my work I now need more time to relax than in the past to become fit again”, “I can stand the pressure of my work very well” (reverse coded for the purposes of the current analyses), “During work I often feel emotionally drained” and “After my work, I usually feel still fit for my leisure activities” (reverse coded for the purposes of the current analyses) (Halbesleben & Demerouti, 2005). The response scale ranged from 1 ‘Does not apply at all’ to 4 ‘Applies completely’. Cronbach's Alpha was .784.

We also measured a set of control variables before graduation namely; self-rated health (1-good, 5-poor), sleep quality (1- good, 5-poor), gender (1-male, 2-woman), experience of night work (0-no,1-yes). Control variables measured three years post graduation were age, living with children in the household (1-

yes, 2-no) and type of employment (0-other,1-permanent employment).

Morningness was also measured as a control variable three years after graduation by a single item asking "are you a morning or evening person?" (1-pronounced morning person, 5- pronounced evening person).

Analysis

A series of regression analyses examined the two shift schedule parameters (number of quick returns worked in a month and number of nights worked per month) as predictors of (i) sleep problems, i.e. sleep quality index, unwinding index, frequency of short sleeps (< 5 hours); (ii) fatigue (recovery, exhaustion), (iii) satisfaction with work hours and (iiii) work-to-family interference index.

Each analysis involved controlling for age, previous self-reported health, previous sleep quality, gender, type of employment, experience of night work prior to graduation, living with children and morningness. Moreover, quick returns were controlled for in the analysis where the frequency of night shifts was the predictor and vice versa.

The impact of different levels of quick returns and night work was examined by categorising the two work schedule parameters and conducting a series of univariate ANOVAs, with planned contrasts between zero frequency and the remaining categories of the dependent variables controlling for the other work schedule parameter, plus the control variables used in the first set of analyses.

Results

After controlling for background variables and night work, the frequency of quick returns was a significant predictor of all sleep-related outcomes, exhaustion, satisfaction with work hours and work-to-family interference (see table 1). In each case, higher frequency predicted more negative outcomes. It did not predict recovery after rest days. Frequency of night work did not predict any of the outcomes, after controlling for background variables and quick returns. Regression weights for the control variables can be found in the supplementary table.

[TABLE 1 ABOUT HERE]

The analysis of different levels of quick returns tend to confirm the pattern observed in the previous analyses, namely that a higher frequency of quick returns was associated with more problems. The only exception was that work-to-family interference was not significantly predicted by frequency of quick returns. Frequent quick returns (starting at 4 times per month or more) were associated with poor sleep quality, more frequent short sleeps and more problems unwinding. Exhaustion increased when working 6 or more quick returns per month. By contrast, the analyses of night shift frequency suggested that in some instances, a higher frequency of night shifts was associated with *fewer* problems. Compared to non-night-workers, nurses working 1-3 nights a month reported fewer sleep problems and were more likely to feel recovered after two rest days. Nurses working 4-6 nights per month were more dissatisfied with their work hours than their non-night-working counterparts.

Discussion

The finding that quick returns had a more negative impact than night work, with respect to the effects on sleep, fatigue and satisfaction with work hours, is relatively unique. Nevertheless, it is consistent with previous evidence concerning shift workers attitudes towards these two aspects of their work schedules (e.g. Akerstedt et al, 2008; 2012). The present study also confirmed previous results showing that quick returns are associated with impaired sleep, shorter sleep and fatigue (Vedaa et al., 2015). However, the levels of impairment observed in the current study were limited, as suggested by the relatively small differences between subgroup means in the analyses of contrasts (see Table 1).

The finding that quick returns were associated with shorter sleeps and reduced sleep quality is in line with previous studies of quick returns between evening and morning shifts (Axelsson et al., 2004; Costa et al., 2014; Knaut et al., 1989; Sallinen et al., 2003). Others have also shown that quick returns are related to restless sleep (Geiger-Brown et al., 2011), shift work disorder (Flo et al., 2012) and insomnia (Eldevik, et al., 2013).

The poorer sleep quality experienced by those working frequent quick returns may have been due to the greater problems these individuals had with unwinding from work. It is unclear whether these problems with unwinding were related to having less time available for rest and recuperation, or to having a strenuous work situation, or possibly a combination of both. Not being able to

stop thinking about work during free time has been shown to be a strong predictor of disturbed sleep (Åkerstedt, et al., 2002).

Quick returns were associated not only with impaired sleep but also with greater levels of exhaustion, both of which may have implications for job performance.

The current study lacked ratings of fatigue and sleepiness but other studies have shown that quick returns are associated with increased sleepiness and fatigue (e.g. Eldevik et al., 2013; Flo et al., 2014; Hakola et al., 2010; Tucker et al., 2010).

Fatigue is a major safety hazard and has been associated with impaired performance, higher error rates and reduced safety (Dawson & McCulloch, 2005).

To date there is scarce information on how quick returns are related to performance and patient safety. However, among nurses quick returns have been linked to increased risk of needle-stick injuries (Trinkoff et al., 2007).

Frequent quick returns were associated with poorer work family balance, although the effects were small. Previous evidence on the relation between quick returns and life outside work is mixed, possibly because the various aspects of non-work life are affected differently by quick returns. While Barton and Folkard (1993) found that an absence of quick returns was associated with less social and domestic disruption, others have failed to find an association between quick returns and work family balance (Tucker et al., 2000; Hakola et al., 2010).

However, Hakola et al (2010) found that possibilities for leisure time activities improved when the number of quick returns was reduced.

Dissatisfaction with work hours was higher among all participants who worked quick returns, irrespective of frequency. The fact that the difference was also present also among those working 1-3 quick returns per month, even though they had relatively few problems with sleep, unwinding and short sleeps, suggests that the dissatisfaction reflected something more than just the negative effect of quick returns on rest, recuperation and work-family balance. Rather, it may reflect dissatisfaction with some other aspect of this groups' work schedule, other than the presence of quick returns.

Previous studies have demonstrated positive effects of reducing the frequency of quick returns (Flo et al., 2014; Hakola, et al., 2010;). Our results provide an insight regarding the frequency at which the negative effects start to appear. Worse sleep quality, short sleep and problems unwinding all seemed to appear when working four or more quick returns per month, whereas exhaustion was greater when working six quick returns per month.

Quick returns predicted negative effects on a range of outcomes, while the frequency of night work did not. This could indicate that short intervals between shifts are more problematic than the misalignment between work hours and sleep/wake patterns that is associated with night work.¹ This is supported by similar findings by Eldevik et al (2013). They demonstrated that while quick returns were significantly associated with insomnia symptoms, excessive fatigue

¹ This is not say that misalignment does not occur as a result of quick returns. However, the degree of misalignment will be much less than when working nights, because the core part of sleep remains aligned with the circadian trough.

or sleepiness, night work was not. However, in the present study it is also possible that the apparently benign effects of night work, relative to quick returns, reflect differences in job strain and work load. Those working quick returns may have experienced greater job strain and work load, when compared to those who did not work quick returns; whereas those working nights may have experienced relatively low levels of job strain and work load, when compared with those who did not work nights (c.f. Nicoletti et al., 2014). Such differences in job strain and work load could partially account for the observed differences in sleep and recuperation.

In the analysis of number of nights worked (Table 1), those working 1-3 nights reported the best sleep quality and were most likely to feel recovered after two days off. While it could be anticipated that among night workers, those working the fewest nights would report the fewest problems, it is perhaps more surprising that this group uniquely reported fewer problems than their day working counterparts. One possible explanation is that nurses with poor sleep quality early in their career either avoid night work or have already transferred into working exclusively day shifts, leaving only those most able to cope with nightwork in those positions (the 'healthy shiftworker effect'; Knutsson & Åkerstedt, 1992).

The analyses comparing different levels of quick returns and night shifts found that even where significant differences were observed, the size of the differences were relatively small. For example, as can be seen in Table 1, sleep quality scores for those working <4 quick returns per month, 4-6 per month and >6 per month

were 2.3, 2.4 and 2.5, respectively. Hence the practical significance of at least some of these findings may be called into question. However, we would argue that while overall group means may not differ substantially, they may indicate that especially vulnerable individuals (e.g. those with pre-existing sleep problems or otherwise impaired wellbeing) are at greater risk, e.g. from working frequent quick returns.

Some of the strengths of the present study are the high response rate (67%) and that we were able to control for confounding factors measured before participants entered working life. Moreover, by asking for indications of the number of quick returns and night shifts worked in the past month, our measures of exposure are probably more reliable than in previous studies that have asked for the frequency in the past 12 months (e.g. Eldevik et al., 2013; Flo et al., 2012;2014). Among the study's weaknesses is the use of a cross sectional design which limits the possibility to draw conclusions regarding causality. The sample comprised relatively young and mostly female nurses, thus limiting the possibilities for generalizing to older workers and males, even if both gender and age was controlled for in the analysis. Another limitation was the use of self-ratings and lack of objective measures, although we used well-validated measurement scales that have been successfully used in other studies.

To conclude, our findings show that insufficient recovery opportunity between shifts, in terms of quick returns, is a determinant of sleep, recovery, exhaustion and work-family balance. Moreover, night work was associated with only very limited negative outcomes in the present study. This suggests that short intervals

between shifts are more problematic than the misalignment between work hours and sleep/wake patterns that is associated with night work.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Table 1: Results of regressions and ANOVAs of work schedule parameters on sleep, fatigue, satisfaction family interference. (Continued overleaf).

	Quick returns							
	Regression analysis				ANOVA with planned contrast			
	Crude Beta	P	Adjusted Beta ^o	P	F ^o	P	Contrasts	Mean
Sleep quality index [#]	.111	.003 **	.149	.000 ***	4.063	.007 **	0 v 1-3 0 v 4-6 * 0 v >6 **	2.2±.0 2.2±.0 2.2±.0
Unwinding index [#]	.194	.000 ***	.196	.000 ***	8.692	.000***	0 v 1-3 0 v 4-6 ** 0 v >6 ***	2.1±.0 2.1±.0 2.1±.0
Sleeps < 5 hours [#]	.206	.000 ***	.211	.000 ***	9.728	.000***	0 v 1-3 0 v 4-6 *** 0 v >6 ***	2.3±.0 2.3±.0 2.3±.0
Feeling rested after w/e ... [#]	.058	.130	.066	.089	1.230	.298	0 v 1-3 0 v 4-6 0 v >6	2.3±.0 2.3±.0 2.3±.0
Exhaustion (OLBI) ^{##}	.125	.001 **	.110	.004 **	3.424	.017*	0 v 1-3 0 v 4-6 0 v >6 **	2.2±.0 2.2±.0 2.2±.0
Satisfaction work hours ^{##}	.361	.000 ***	.362	.000 ***	32.943	.000 ***	0 v 1-3 *** 0 v 4-6 *** 0 v >6 ***	1.7±.0 1.7±.0 1.7±.0
Work-family imbalance [#]	.115	.003***	.092	.017 *	1.822	.131	0 v 1-3 0 v 4-6 0 v >6	2.1±.0 2.1±.0 2.1±.0

* = p<.05; ** = p<.01; *** = p<.001. # Scale 1-5; ## Scale 1-4; High values indicate more problems. ° Contrasts were used to compare 0 v 1-3, 0 v 4-6, and 0 v >6. Controlling for age, education, self-reported health, previous sleep quality, gender, type of employment, prior experience of night work, living with a partner, and frequency of night shifts.

Table 1 (Continued)

	Regression analysis				ANOVA with planned contrast			
	Crude Beta	P	Adjusted Beta [°]	P	F [°]	P	Contrasts	Mean ± SD
Sleep quality index [#]	-.018	.636	.011	.765	2.969	.031 *	0 v 1-3 ** 0 v 4-6 0 v >6	2.4±.04 v 2.4 2.4±.04 v 2.4 2.4±.04 v 2.4
Unwinding index [#]	-.102	.007 **	-.059	.112	1.468	.222	0 v 1-3 0 v 4-6 0 v >6	2.3±.04 v 2.3 2.3±.04 v 2.3 2.3±.04 v 2.3
Sleep <5 hours [#]	-.002	.968	.017	.644	1.500	.213	0 v 1-3 0 v 4-6 0 v >6	2.5±.05 v 2.5 2.5±.05 v 2.5 2.5±.05 v 2.5
Feeling rested after w/e ... [#]	.017	.655	.033	.396	3.852	.009 **	0 v 1-3 ** 0 v 4-6 0 v >6	2.4±.05 v 2.4 2.4±.05 v 2.4 2.4±.05 v 2.4
Exhaustion (OLBI) ^{##}	-.075	.051	-.050	.187	3.287	.020*	0 v 1-3 0 v 4-6 0 v >6 *	2.3±.03 v 2.3 2.3±.03 v 2.3 2.3±.03 v 2.3
Satisfaction work hours ^{##}	.008	.837	.063	.089	3.351	.019 *	0 v 1-3 0 v 4-6 **	2.0±.04 v 2.0 2.0±.04 v 2.0

Work-family imbalance#	-.081	.034 *	-.054	.161	2.916	.034*	0 v >6 0 v 1-3 0 v 4-6 0 >6(*)	2.0±.04 v 2. 2.2±.04 v 2. 2.2±.04 v 2. 2.2±.04 v 1.
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* = p<.05; ** = p<.01; *** = p<.001. # Scale 1-5; ## Scale 1-4; High values indicate more problems. ° Contr reported health, previous sleep quality, gender, type of employment, prior experience of night work, liv and frequency of quick returns.

Supplementary Table: Regression weights for the control variables, on each of the outcome variables.

		Adjusted Beta	P
Sleep quality index	Age	-.029	.485
	Previous self-reported health	-.075	.055
	Previous sleep quality	-.330	.000 ***
	Gender	-.020	.570
	Type of employment	.083	.042 *
	Prior experience of nightwork	.001	.976
	Living with children	-.004	.919
	Morningness	.003	.933
Unwinding index	Age	-.086	.042 *
	Previous self-reported health	-.112	.004 **
	Previous sleep quality	-.197	.000 ***
	Gender	-.107	.003 **
	Type of employment	-.095	.022 *
	Prior experience of nightwork	.034	.349
	Living with children	.088	.015 *
	Morningness	-.044	.226
Sleeps < 5 hours	Age	-.004	.917
	Previous self-reported health	-.026	.523
	Previous sleep quality	-.206	.000 ***
	Gender	-.025	.498
	Type of employment	.025	.551
	Prior experience of nightwork	-.100	.007 **
	Living with children	.035	.343
	Morningness	-.107	.004 **
Feeling rested after w/e	Age	.005	.916
	Previous self-reported health	.073	.076
	Previous sleep quality	.225	.000 ***
	Gender	.035	.361
	Type of employment	.026	.550
	Prior experience of nightwork	.028	.457
	Living with children	-.097	.010 *
	Morningness	.035	.358

Exhaustion (OLBI)	Age	-.030	.484
	Previous self-reported health	.213	.000 ***
	Previous sleep quality	.078	.055
	Gender	.090	.016 *
	Type of employment	.105	.014 *
	Prior experience of nightwork	-.012	.736
	Living with children	-.072	.053
	Morningness	.065	.085
Satisfaction work hours	Age	.013	.764
	Previous self-reported health	.046	.246
	Previous sleep quality	.005	.898
	Gender	.011	.760
	Type of employment	.067	.105
	Prior experience of nightwork	.043	.234
	Living with children	-.004	.921
	Morningness	.004	.908
Work-family imbalance	Age	.068	.125
	Previous self-reported health	-.129	.002 **
	Previous sleep quality	-.148	.000 ***
	Gender	-.064	.091
	Type of employment	-.073	.093
	Prior experience of nightwork	.004	.905
	Living with children	.045	.229
	Morningness	.025	.513

* = p<.05; ** = p<.01; *** = p<.001