



**CENTRO UNIVERSITÁRIO DE ANÁPOLIS  
UNIEVANGÉLICA  
CURSO DE ODONTOLOGIA**

**ANÁLISE DO RUÍDO PRODUZIDO PELAS CANETAS DE ALTA E  
BAIXA ROTAÇÃO E O IMPACTO NA PERDA AUDITIVA DO  
CIRURGIÃO DENTISTA**

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# **ANÁLISE DO RUÍDO PRODUZIDO PELAS CANETAS DE ALTA E BAIXA ROTAÇÃO E O IMPACTO NA PERDA AUDITIVA DO CIRURGIÃO DENTISTA**

ANALYSIS OF NOISE PRODUCED BY HIGH AND LOW ROTATION PUNCHES AND THE IMPACT ON HEARING LOSS OF DENTAL SURGERY

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## Resumo

O objetivo desse estudo foi mensurar os efeitos sonoros produzidos pelos equipamentos utilizados em procedimentos odontológicos. A pesquisa foi desenvolvida em 14 consultórios odontológicos do município de Anápolis- GO, utilizando um dispositivo audiométrico que forneceu dados sobre a pressão dos sonora e tempo de exposição dos profissionais. Foi avaliado o som de 110 canetas de alta e baixa rotação acionadas por 20 segundos com intervalo de 30 segundos, em ambiente laboratorial controlado. A média das canetas de alta e baixa rotação foram respectivamente, 80,36dB e 74,99dB, enquanto a moda foi de 84dB e 71,5dB, com DP de 4,48 e 4,89. O tempo médio dos procedimentos nas clínicas foi de 0:29 min com média de 77,68dB. Não houve diferença estatística entre as marcas analisadas. Não foi constatado uma relação de causa e efeito entre os ruídos produzidos pelas canetas odontológicas, tempo de exposição diário e perda auditiva do cirurgião-dentista.

**Palavras- chave:** Ruído ocupacional, Perda auditiva, Medição de ruído.

## Abstract

The aim of this study was to measure and analyze the sound effects produced by dental equipment in procedures performed by dentists. This research was performed in 14 dental clinics in the city of Anápolis-GO using an audiometric device that provided data on the sounds and time of exposure of the professionals. Then, the sound of 110 high and low speed dental handpieces was evaluated for 20 seconds with an interval of 30 seconds. The average of the high and handpieces were, respectively, 80.36dB and 74.99dB, while the fashion was 84dB and 71.5dB, with a DP of 4.48 and 4, 89. The mean time of the procedures during the measurement in the clinics was 0:29 min with a mean of 77.68dB. There was no statistical difference between the analyzed brands. A cause-and-effect relationship between noise produced by dental handpieces, daily exposure time, and hearing loss of dentists was not observed.

**KEYWORDS:** Noise occupational; Hearing loss; Noise induced; Noise Measurement

# 1 INTRODUÇÃO

Um dos maiores avanços na Odontologia ocorreu perante o desenvolvimento de instrumentos rotatórios que facilitam os procedimentos odontológicos. Por volta da década de 50 foram introduzidas no mercado canetas de alta rotação com velocidade de aproximadamente 200.000 rpm (HYSON,2002). Porém, foi evidenciado que tais equipamentos produziam altos níveis de ruído emitidos (aproximadamente 100 dB) e em alta frequência (acima de 6.000 Hz) estes valores estão acima dos limites toleráveis para o aparelho auditivo do ser humano (SHINOHARA & MITSUDA, 1998).

O som é definido como a impressão fisiológica causada por uma onda mecânica quando esta atinge a parte interna do ouvido. Podem surgir dois perfis de estímulo, um deles é considerado como uma sensação prazerosa que é aquela relacionada à música ou a fala, em contrapartida o ruído normalmente é usado para descrever um som indesejado (MELLO et al.,1999).

Estes sons indesejados causam no indivíduo diversos distúrbios que podem levar ao desenvolvimento de doenças ocupacionais, por exemplo a Perda Auditiva Induzida por Ruído (PAIR) que é muito comum em trabalhadores expostos a altos níveis de emissão sonora por um longo período de tempo. Esta exposição pode levar a perda temporária ou permanente da audição, dependendo diretamente da frequência e intensidade do ruído (LOPES; MELO; SANTOS, 2012). Existem normas que estabelecem o limite de tolerância para ruídos contínuos ou intermitentes como a NR 15 da portaria 3.214. Esta por sua vez regulamenta que o limite de ruído para 8 horas diárias não deve ultrapassar os 85 dB.

Os cirurgiões-dentistas estão expostos a dois tipos de ruídos constantemente, o ambiental que é proveniente dos sons emitidos externamente como, sala de espera, trânsito, e ruídos provenientes da própria área de trabalho como compressores, bomba a vácuo, peças de mão de alta e baixa rotação (SILVA et al., 2016).

Ao longo dos anos as canetas de alta rotação passaram por modificações a fim de minimizar e diminuir os ruídos emitidos. Atualmente segundo todos os fabricantes, estas não ultrapassam valores acima de 85 dB como preconizado na NR 15. Contudo, as peças de mão de alta e baixa rotação ainda são vistas

pelos discentes e profissionais da Odontologia como as principais causadoras de alterações no aparelho auditivo com seu uso prolongado (MARQUES et al., 2015).

Considerando o risco ocupacional enfrentado no dia a dia clínico da maioria dos cirurgiões dentistas, o objetivo desse estudo foi analisar os efeitos sonoros produzidos pelos equipamentos odontológicos em procedimentos realizados pelos profissionais da Odontologia.

## **2 MATERIAL E MÉTODO**

### **2.1 Desenho de estudo**

Trata-se de um estudo quantitativo, observacional transversal realizado no Centro Universitário de Anápolis- UniEVANGÉLICA e em Clínicas Odontológicas do município de Anápolis, Goiás, Brasil. A coleta e análise dos dados aconteceu entre os meses de agosto a outubro de 2018. As etapas da metodologia estão demonstradas em fluxograma. (Figura1)

### **2.2 Participantes**

Para selecionar os participantes foi adotado o método de amostragem intencional. A amostra contou com 14 Clínicas Odontológicas do município de Anápolis e as 110 canetas de alta rotação das marcas Kavo®, Gnatus® e Dabi Atlante®. O critério de inclusão para as Clínicas Odontológicas foi estar devidamente credenciadas junto ao Conselho Federal de Odontologia (CFO). Foram excluídos da pesquisa os estabelecimentos odontológicos que não tinham os equipamentos em bom estado de conservação ou estavam danificados. A pesquisa foi previamente aprovada pelo Comitê de Ética em Pesquisa (CEP) da instituição em que foi realizada a pesquisa, com o número do parecer 2.741.206. Os princípios regidos pelas normas nacionais e internacionais que regulam as pesquisas com seres humanos foram seguidos por este trabalho, assim respeitando as determinações da resolução 466/12 do Conselho Nacional de Saúde (CNS), garantindo a confidencialidade, anonimato e não utilização das informações em prejuízo dos indivíduos.

### **2.3 Procedimentos**

Os pesquisadores devidamente calibrados para realização do procedimento, realizaram a aferição da intensidade dos ruídos dos motores de alta rotação e baixa rotação por meio de um decibelímetro digital MSL- 1325A Minipa.

Para a etapa laboratorial da pesquisa foi realizada a aferição dos ruídos das peças de alta e baixa rotação no laboratório de disciplinas profissionalizantes do curso de Odontologia do Centro Universitário de Anápolis – UniEVANGÉLICA, a fim de verificar a emissão do ruído produzido isoladamente



pelas peças de mão. Seguindo os padrões de normas do INMETRO, as medições foram realizadas 3 vezes em cada peça por 20 segundos em máxima potência e intervalo de 30 segundos entre as medições. Obteve-se uma média dos valores. Para padronização das aferições foi elaborada e executada uma caixa acústica com as dimensões de 50x30x30cm, com o interior revestido por material de isolamento acústico. Tampa dimensão 51,1x32x3cm, com uma abertura de 10x20cm na parte esquerda para a visualização do interior. A parte frontal da caixa apresenta uma abertura na parte esquerda com circunferência de 3 cm, este local para a inserção do equipamento rotatório. No lado lateral direito uma abertura de 5,5x3cm, para inserção local do decibelímetro. Dessa forma mantendo o ambiente controlado e padronizado para todas as aferições.

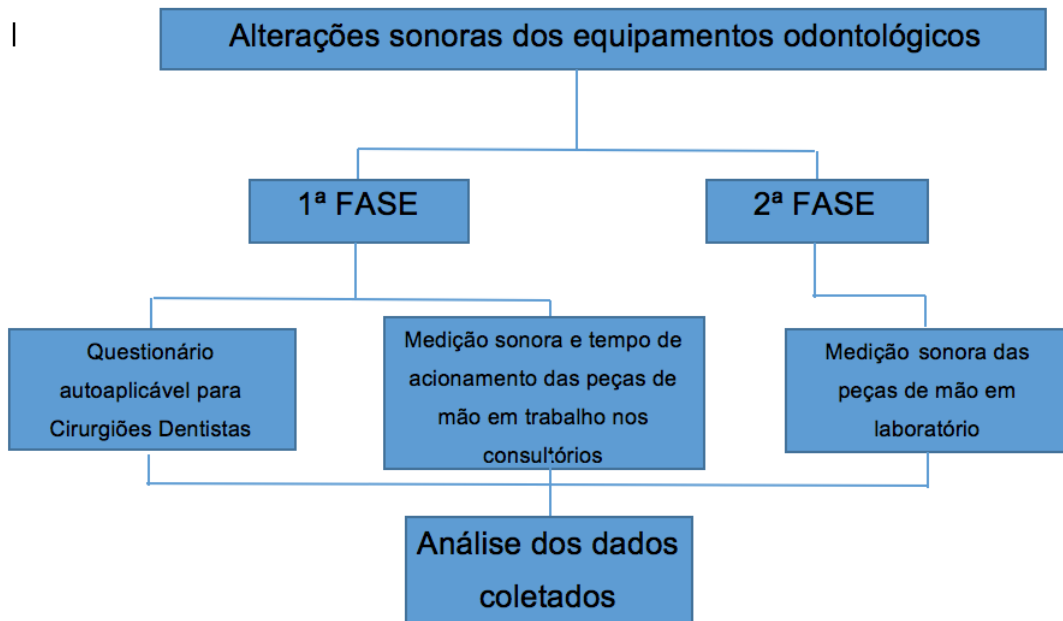
A etapa em campo foi realizada em 14 Clínicas Odontológicas do município de Anápolis para a aferição de todos os ruídos produzidos no posto de trabalho odontológico durante determinado procedimento. O cirurgião-dentista responsável pelo procedimento executado em cada clínica respondeu um questionário estruturado e autoaplicável com questões sobre manuseio e quantidade de lubrificação das peças, uso de sugador de alta e baixa potência e presença de bomba a vácuo no consultório.

Nas clínicas odontológicas o ponto eleito para a realização das medições em consultório foi atrás do encosto de cabeça da cadeira odontológica a aproximadamente 40 cm de distância do ponto 0 de referência, boca do paciente, além da medição da bomba á vácuo em funcionamento. Esses pontos foram medidos em intervalos dependendo da duração do procedimento realizado pelo cirurgião-dentista. Foi levado em consideração que a altura do decibelímetro seguiu as medidas antropométricas de 67 cm (referente a somatória da altura do cotovelo ao assento de 27 cm, mais 40 cm referente à altura do mocho) Segundo Vicente (2015) e a NBR 13962:2006.

#### **2.4 Análise de dados**

Os resultados foram catalogados e submetidos à Inferência Estatística, foram somados e processados mediante os critérios de classificação de forma eletrônica utilizando o software Excel® 2010 (Microsoft, Redmond, WA, EUA).

Todos os dados foram dispostos em tabelas e gráficos seguindo as normas nacionais de organização de tabelas, ditadas pela ABNT.



**Figura 1:** Fluxograma referente às etapas da metodologia.

### 3 RESULTADOS

Os dados foram compilados e processados de forma eletrônica utilizando o software Excel® 2010 (Microsoft, Redmond, WA, EUA). Para comparação da emissão sonora produzida pelas peças rotatórias em ambiente clínico e laboratorial. O aparelho utilizado para a coleta de dados foi um Decibelímetro Digital MSL- 1325A Minipa com faixa de nível entre 60 a 90 dB, ponderação de frequência A e tempo de ponderação Slow (o que garante uma maior sensibilidade e precisão durante a aferição)

Para a etapa laboratorial da pesquisa, foi avaliada a pressão sonora de 110 instrumentos rotatórios das marcas Dabi Atlante®, Kavo® e Gnatus®, pertencentes aos acadêmicos do 2ª ao 8º período do Curso de Odontologia do Centro Universitário de Anápolis-UniEVANGÉLICA

A tabela 1 apresenta a média dos sons emitidos por canetas de alta rotação, por marca e modelo. A média geral de ruído de todas as marcas e modelos das canetas de alta rotação foi de 80,36 dB. O modelo Kavo 63CP apresentou o valor mais baixo.

<b>Marca</b>	<b>Modelo</b>	<b>Médias (dB)</b>
Dabi Atlante	Silent	80,61
<b>Dabi Atlante Média</b>		<b>80,61</b>
Gnatus	AR 32 PB TB	80,02
	SL 30 PB TB	80,62
<b>Gnatus Média</b>		<b>80,25</b>
Kavo	505 C	80,50
	605 C	80,5
	63 CP	77,66
<b>Kavo Média</b>		<b>80,46</b>
	<b>Média Geral</b>	<b>80,36</b>

A tabela 2 mostra as marcas e modelos das peças de baixa rotação analisadas com suas respectivas médias de ruído. A caneta 32MM TBS Gnatus produziu menor ruído de 73,08 dB durante a avaliação, e o maior ruído foi observado na peça 10LP da marca Kavo de 85,67 dB. A média geral de sons

emitidos pelas canetas de baixa rotação foi menor que as peças com alta rotação. O valor de moda encontrado para as canetas de alta rotação foi de 84dB com DP de 4,48. E para as peças de baixa rotação, moda de 71,5dB com DP de 4,89.

**Tabela 2 – Ruídos em (dB) das marcas e modelos das caneta baixa rotação.**

<b>Marca</b>	<b>Modelo</b>	<b>Médias(dB)</b>
<b>Dabi Atlante</b>	N 270	79,29
<b>Gnatus</b>	32 MM TBS	73,08
	SL 30 TBS	75,42
<b>Kavo</b>	500	73,78
	600	78,33
	10 LP	85,67
<b>Média Geral</b>		<b>74,99</b>

A etapa Clínica foi realizada em 14 consultórios odontológicos do município de Anápolis, durante procedimentos restauradores. Ao final do atendimento foi aplicado um questionário para diagnóstico do padrão de manutenção dos principais equipamentos do consultório. Os procedimentos foram cronometrados e dados como presença de sugador no momento do procedimento também foram analisados, além do tempo de uso das cadeiras clínicas e a lubrificação dos instrumentos rotatórios. A média geral de ruídos nas clínicas foi de 77,68 dB com tempo de cada procedimento em média de 29 min analisando um paciente, porém a média do tempo de pacientes atendidos em horário comercial é de 4 horas. Sobre as cadeiras clínicas as marcas encontradas foram Gnatus e Kavo, sendo que a média geral do tempo de uso das cadeiras foram de 7 anos. Quanto ao manuseio das canetas, verificamos que os responsáveis pelo atendimento é quem as lubrifica sendo constatado que dez dos profissionais lubrificaram uma vez antes do procedimento, dois lubrificaram mais de 2 vezes após os procedimentos e dois que não lubrificaram em momento algum. A tabela 3 apresenta a descrição dos ruídos durante procedimento odontológico e presença ou ausência de sugador durante os procedimentos.

A utilização dos sugadores durante o procedimento fornece um acréscimo da intensidade sonora, foi observada a média de 14 dB entre as que não usaram o sugador, sendo que onze profissionais atenderam com o sugador acionado e três atenderam com o sugador desligado.

**Tabela 3 – Ruídos em (dB) das clínicas odontológicas analisadas Município de Anápolis-GO.**

<b>Clínicas</b>	<b>Sugador</b>	<b>Médias(dB)</b>
1	Não	72,67
2	Sim	78,17
3	Sim	77,50
4	Sim	82,33
5	Sim	78,83
6	Não	63,17
7	Não	73,50
8	Sim	86,83
9	Sim	80,33
10	Sim	78,67
11	Sim	80,50
12	Sim	80,50
13	Sim	76,50
14	Sim	78,00
<b>Total Geral</b>		<b>77,68</b>

## 4 DISCUSSÃO

Um dos fatores de risco presentes no desenvolvimento do trabalho do cirurgião-dentista é o ruído produzido pelas peças de mão, alta rotação, compressor, sugadores, ar condicionado, ruídos externos (GAMBARRA et al. 2012; PARAGUAY, 1999; SOUZA, 1998). Em sua pesquisa, Cavalcanti e Andrade 2016 verificaram que 56% dos odontólogos de sua amostra apresentavam problemas auditivos.

Estudos realizados por GAMBARRA et al. (2012); NOGUEIRA (1983) e TORRES (2007) apontam que o ruído mais intenso identificado no interior do consultório odontológico é o provocado pela caneta de alta rotação. E que esses equipamentos podem levar a uma perda auditiva induzida por ruído (PAIR) quando for maior do que 85 dB por 8 horas diárias.

No entanto, na nossa pesquisa em ambiente controlado, foram encontrados médias gerais menores que 85 dB, onde foi desconsiderado o ruído do ambiente, estando todas as canetas dentro da norma estabelecida pela NR15. O que se confirma nos estudos de COLES e HOARE (1985), KEENAN (1999), que as primeiras evidências sobre as consequências da perda de audição induzida pelo ruído de alta rotação foram inconclusivas: alguns pesquisadores acharam que havia a possibilidade de algum tipo de dano para a audição, mas outros estudiosos do assunto não encontraram evidência alguma que comprovasse esses resultados.

A ideia da mensuração de níveis de pressão sonora manifestou-se através das inúmeras vezes que nos sentimos estressados durante o atendimento aos pacientes pelo desconforto que o ruído dos equipamentos odontológicos nos causava e ainda se estes eram nocivos ou não ao cirurgião-dentista. A metodologia utilizada para o desenvolvimento deste trabalho foi de natureza quantitativa experimental, onde a coleta de dados deu-se empregando os mesmos princípios de alguns autores com algumas alterações para sua elaboração (LOURENÇO, 2011; LACERDA, 2001; FERNANDES, 2011; MEDEIROS, 1999).

A perda auditiva é a única doença específica associada a exposições de ruídos, sendo a mais observada e mensurada pelos profissionais da saúde

(OLIVA,2008; KEENAN, 1998). Os distúrbios atribuídos à exposição contínua dependem de alguns fatores como: o tempo de exposição, a susceptibilidade a frequência do ruído, e também a intensidade, a duração e o ritmo (OLIVA,2008).

GROSS et al. (2002), em pesquisa realizada com canetas de alta rotação concluíram que o nível de ruído em virtude do tempo de uso teve como resultado uma variação insignificante, não trazendo risco para o profissional, porque o nível estava abaixo de 85 dBA. Porém o que foi percebido é que o ruído aumenta mais com os maus tratos em relação à caneta, do que com o tempo de uso. Os acadêmicos proprietários das peças analisadas têm no máximo três anos de uso incontinuo, ou seja, apenas durante os procedimentos exigidos pelo curso, dessa forma, as peças são consideradas novas. BARROS (1993) ainda afirma em pesquisa efetuada por BOHREN (1981) que é extremamente improvável que o emprego correto das turbinas modernas prejudique a audição dos odontólogos.

No entanto, em um ambiente clínico, as peças montadas não produzem ruídos sozinhas, existem níveis de ruídos que devem ser levados em consideração como a localização dos consultórios no espaço urbano, o grande fluxo de veículos, o som ambiente da sala de espera e o ruído do ar condicionado, que passam despercebidos pelos odontólogos, mas produzem sons mais nocivos a audição quando associados aos sons emitidos pelas canetas de alta e baixa rotação (COSTA ,1989; SAQUY, 1996). A NBR 10152 cujo título é: “Acústica – Níveis de Pressão Sonora em Ambientes Internos a Edificações, preconiza que em ambientes internos, ruídos acima de 65dB podem se tornar um incômodo para concentração e comunicação. Sendo assim, os ambientes clínicos analisados nessa pesquisa encontram-se fora do padrão por apresentar níveis de ruídos fora do preconizado.

Porém, segundo LACERDA et al. (2001) os níveis de ruído no consultório odontológico produzido pela caneta de alta e baixa rotação não são contínuos por 8 horas, dessa forma, a exposição não se assemelha a de outras atividades profissionais. Assim, foi evidenciado nessa pesquisa que em relação ao tempo de acionamento das canetas foi encontrado que a média de cada procedimento é de aproximadamente 29 minutos, o que nos leva a afirmar que o cirurgião-dentista não está exposto ao ruído da caneta durante 8 horas diárias contínuas pois o mesmo não permanece todo tempo em atendimento com as canetas acionadas.

Portanto, com os resultados desse estudo, conclui-se que o ruído emitido pelas peças de alta e baixa rotação isoladamente não levam a PAIR, pois esses mesmos equipamentos vem sofrendo positivas evoluções em relação a sua construção e estrutura que corrobora para que as peças de mãos não sejam os vilões na perda da audição dos cirurgiões-dentistas. Apesar dos resultados, é necessário que os profissionais façam a prevenção de possíveis alterações auditivas irreversíveis causadas por ruídos da prática clínica. O uso de equipamentos de proteção auditiva e exames periódicos para avaliação audiométrica são recomendados.



## 5 CONCLUSÃO

Os efeitos sonoros produzidos pelas peças rotatórias em procedimentos odontológicos são inferiores ao que consta na NR 15 e os profissionais não utilizam as canetas acionadas por 8 horas diárias. Sendo assim a relação da perda auditiva e o som produzido pelas canetas de alta rotações em padrões de normalidade não apresentam uma influência direta na possível perda auditiva dos cirurgiões-dentistas. Apesar dos resultados apresentados, é necessário que os profissionais façam a prevenção de possíveis alterações auditivas irreversíveis causadas por ruídos da prática clínica, pois observamos que o ambiente do consultório odontológico é difuso e influenciado por várias fontes produtoras de pressões sonoras.

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## ANEXO

### (ANEXO I)

#### PARECER CONSUBSTANCIADO DO CEP

#### DADOS DO PROJETO DE PESQUISA

**Título da Pesquisa:** MENSURAÇÃO E ANÁLISE DAS ALTERAÇÕES SONORAS PRODUZIDAS NO POSTO DE TRABALHO

**ODONTOLÓGICO Pesquisador:** DIOGO RODRIGUES CRUVINEL **Área Temática:**

**Versão:** 2

**CAAE:** 86487418.4.0000.5076

**Instituição Proponente:** Centro Universitário de Anápolis - UniEVANGÉLICA

**Patrocinador Principal:** Financiamento Próprio

#### DADOS DO PARECER

**Número do Parecer:** 2.741.206

#### Apresentação do Projeto:

De acordo com parecer número: 2.617.178.

#### Objetivo da Pesquisa:

Objetivo geral:

Mensurar e analisar os efeitos sonoros produzidos pelos equipamentos odontológicos em procedimentos realizados pelos profissionais da Odontologia.

Objetivos específicos:

- Avaliar o real tempo de emissão dos sons realizados com procedimentos pelas canetas de alta, baixa rotação e contra ângulo durante a execução de procedimentos clínicos.
- Verificar e comparar as canetas de alta rotação de marcas distintas em relação ao preconizado a norma

ISO 7785-1 (processo de atualização) avaliando a produção sonora que as mesmas emitem. Segundo a NR 15 anexo 1, a partir dos resultados obtidos nas pesquisas, verificaremos o possível desenvolvimento de doenças ocupacionais provocadas pela emissão sonora de tais equipamentos durante a vida acadêmica e profissionais de cirurgiões dentistas.

#### Avaliação dos Riscos e Benefícios:

De acordo com parecer número: 2.617.178.

### Comentários e Considerações sobre a Pesquisa:

De acordo com parecer número: 2.617.178.

### Considerações sobre os Termos de apresentação obrigatória:

De acordo com as recomendações previstas pela RESOLUÇÃO CNS N.466/2012 e demais complementares o protocolo permitiu a realização da análise ética. Todos os documentos listados abaixo foram analisados.

### Considerações Finais a critério do CEP:

O protocolo de pesquisa encontra-se de acordo com a Resolução 466/12 do CNS, não apresentando nenhum óbice ético para sua execução. Diante do exposto, o Comitê de Ética em Pesquisa - CEP UniEVANGÉLICA, de acordo com as atribuições definidas na Resolução CNS 466/2012, manifesta-se por aprovar o presente projeto. Solicitamos ao pesquisador responsável o envio do RELATÓRIO FINAL a este CEP, via Plataforma Brasil, conforme cronograma de execução apresentado.

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_1076288.pdf	21/05/2018 19:38:30		Aceito
Declaração de Pesquisadores	CartarespostaCEP.docx	21/05/2018 19:37:13	REBECA DOS SANTOS ROCHA	Aceito
Projeto Detalhado / Brochura Investigador	Projeto.doc	15/05/2018 20:06:45	REBECA DOS SANTOS ROCHA	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	tcle_academicos.doc	15/05/2018 20:06:27	REBECA DOS SANTOS ROCHA	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE.doc	15/05/2018 20:06:14	REBECA DOS SANTOS ROCHA	Aceito
Declaração de Instituição e Infraestrutura	declaracao.pdf	28/03/2018 16:01:22	DIOGO RODRIGUES CRUVINEL	Aceito
Folha de Rosto	CCF28032018.pdf	28/03/2018 15:49:49	DIOGO RODRIGUES CRUVINEL	Aceito
Outros	Lattes.docx	09/02/2018 17:32:24	DIOGO RODRIGUES CRUVINEL	Aceito
Outros	Questionario.docx	09/02/2018 17:08:09	DIOGO RODRIGUES CRUVINEL	Aceito
Recurso Anexado pelo Pesquisador	Termo.doc	09/02/2018 16:47:59	DIOGO RODRIGUES CRUVINEL	Aceito

**Situação do Parecer:** Aprovado  
**Necessita Apreciação da CONEP:** Não

ANAPOLIS, 27 de junho de 2018

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**Assinado por:**  
**Fabiane Alves de Carvalho Ribeiro**  
**(Coordenador )**

## ANEXO

### (ANEXO I)



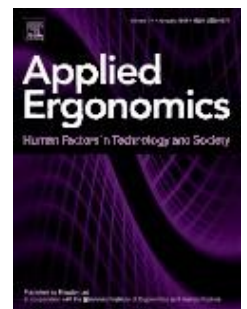
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Human Factors in Technology and Society

## AUTHOR INFORMATION PACK

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*Applied Ergonomics* is aimed at ergonomists and all those interested in applying **ergonomics**/human factors in the design, planning and management of technical and social systems at work or leisure. Readership is truly international with subscribers in over 50 countries. Professionals for whom *Applied Ergonomics* is of interest include: ergonomists, designers, industrial engineers, health and safety specialists, systems engineers, design engineers, organizational psychologists, occupational health specialists and human-computer interaction specialists.

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Results should be clear and concise.

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