

Assessing Ergonomic Risk Levels In Fabrication Work: The Quick Exposure Checklist (QEC) Approach

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Abstract

This study aims to evaluate the effectiveness of the Quick Exposure Checklist (QEC) approach in identifying and quantifying ergonomic risks in fabrication work environments, encompassing tasks such as grinding, welding, and turning. The research employs a quantitative approach, utilizing the Quick Exposure Checklist (QEC) to systematically assess ergonomic risks associated with work postures, repetitive movements, and physical strength demands across three types of jobs in fabrication. Data were collected through direct observation of workers, followed by detailed analysis of the posture, repetition, force, and duration of each task. Analysis of the ergonomic risk levels using QEC revealed significant findings. For welding tasks, the total QEC score reached 127, indicating a critical level of risk (Action Level 4). Grinding and turning tasks scored 93 and 89, respectively, both categorized under Action Level 3, which calls for immediate and future risk mitigation strategies. The application of the QEC method effectively quantifies and categorizes ergonomic risks in fabrication work, highlighting the critical need for intervention in tasks with high risk. These findings support the implementation of targeted ergonomic interventions to improve worker safety and productivity

Keywords: Fabrication work, quick exposure checklist, risk level, ergonomic

INTRODUCTION

In the field of industrial engineering, ergonomic risk assessments play a pivotal role in enhancing worker safety and operational efficiency, particularly in high-precision fabrication environments like those involving grinding, welding, and turning. These tasks, notorious for their physically demanding nature, have been extensively documented to lead to musculoskeletal disorders, one of the most common occupational ailments affecting workers across various industries (Irsyad Ali Syahid et al., 2021; Rizaldi & Cahyana, 2022). As a result of these working conditions, workers may suffer from musculoskeletal injuries, fatigue, and even workplace accidents, which not only impact

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the well-being of individual workers but also result in economic losses for both the company and society at large (Ade Sri Mariawati et al., 2023; Oliv et al., 2019).

Given the importance of maintaining the health and safety of workers in fabrication environments, an ergonomic approach becomes critically essential. Ergonomics, the science of efficiency in work conditions, aims to optimize worker well-being while simultaneously enhancing performance and productivity (Amanda Yudhistira et al., 2023; Ibrahim et al., 2020; Subakti & Subhan, 2021). In this context, ergonomic risk assessment becomes a crucial initial step to identify and mitigate potential hazards that workers may encounter. Page numbering is not required for the manuscript. The manuscript must be written in English, adhering to proper grammatical conventions.

Recent advancements in ergonomic assessment techniques have emphasized the importance of quick and reliable methods to assess risks associated with work postures, repetitive movements, and physical strain. Among these, the Quick Exposure Checklist (QEC) has emerged as a notable method due to its systematic approach in evaluating ergonomic risks and its proven effectiveness in various industrial settings (Bastuti & Zulziar, 2020; Yul, 2021). The QEC approach offers a systematic way to assess ergonomic risks associated with work postures, repetitive movements, and the physical force required in tasks. By using QEC, companies can quickly identify high-risk work areas and implement necessary interventions to reduce or eliminate these risks (Adi & Yuamita, 2022; Fariza & Oktalia, 2022; Pinyowiwat, 2020). There is a scarcity of research on the effectiveness of interventions based on the outcomes of the Quick Exposure Checklist (QEC) in reducing ergonomic risks and improving worker health in manufacturing environments.

Innovative Ergonomic Assessment Method: The use of the Quick Exposure Checklist (QEC) represents a novel approach in the context of assessing ergonomic risks in fabrication work. Unlike traditional, often cumbersome, ergonomic assessment tools, QEC offers a streamlined, quick, and efficient method for identifying risk levels associated with different work tasks. This can lead to faster responses and adjustments in the workplace. **Enhanced Precision and Adaptability:** The novelty of the QEC approach also lies in its ability to adapt to various types of fabrication tasks, providing precise measurements of ergonomic risks

This study aims to apply the Quick Exposure Checklist (QEC) approach in measuring the level of ergonomic risk in fabrication work. Through this research, it is expected to ascertain the extent of QEC's effectiveness in identifying and assessing ergonomic risks in the fabrication work environment. This study also seeks to provide practical recommendations for companies in designing and implementing effective ergonomic strategies to enhance worker well-being and productivity. Consequently, the outcomes of this research are anticipated to contribute significantly to preventive efforts



against musculoskeletal disorders and other ergonomic issues in the workplace, as well as support the creation of a safe and healthy work environment for fabrication workers.

Methods

The Quick Exposure Checklist (QEC) analysis for fabrication workers involves several critical stages:

Research Design

This study employs a quantitative approach with a survey method to collect data regarding the level of ergonomic risk in fabrication work. This approach was chosen because it allows for objective measurement of the ergonomic risk exposure faced by workers in various fabrication activities.

Sample Selection

Population and Sampling Technique:

The study focused on a specific population comprising workers and observers within a fabrication environment at a selected manufacturing company. A purposive sampling technique was chosen due to its effectiveness in identifying and selecting individuals who are particularly knowledgeable about or experienced in the ergonomic aspects of fabrication tasks. The sample included individuals directly involved in operational tasks such as grinding, welding, and turning, which are known for their ergonomic challenges..

Data Collection

Instrumentation and Procedures:

Data were gathered using the Quick Exposure Checklist (QEC), administered by researchers through direct observations of the workers as they performed their regular fabrication tasks. Observations were made over several work cycles to ensure comprehensive data capture concerning:

1. Work postures
2. Repetitive movements
3. Force exertion
4. Duration of exposure to tasks

Data Analysis

Analytical Techniques:

The collected data were analyzed quantitatively to calculate the ergonomic risk levels for each worker. The analysis involved:

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1. Assigning scores to various observed ergonomic factors, including posture, repetitive movements, exerted force, and task duration.
2. These scores were aggregated to derive a total ergonomic risk score for each observed task

Results and Discussion

Processing data from collected questionnaires to calculate exposure scores for each observed body part, including the back, shoulder/arm, wrist, and neck. The risk level of injury to these body parts is determined based on the obtained exposure score values, as listed in Table 1.

Table 1. QEC Exposure Score

Score	Exposure Score			
	Low	Moderate	High	Very High
Back (Static)	8-15	16-22	23-29	29-42
Back (Dynamic)	10-20	21-30	31-40	41-56
Shoulder/Arm	10-20	21-30	31-40	41-56
Wrist	10-20	21-30	31-40	41-56
Neck	4-6	8-10	12-14	16-18

Once the questionnaire was completed by all fabrication workers, the responses from the questionnaires filled out by the observers and workers were summarized in the form of a recapitulation, which can be seen in Table 2 and Table 3.

Table 2. Recapitulation of Observer Questionnaire Responses

Job Type	Back		Shoulder/Arm		Wrist		Neck
	A	B	C	D	E	F	G
Grinding	A2	B1	C3	D2	E1	F1	G2
Welding	A2	B1	C3	D3	E2	F3	G2
Turning	A1	B2	C1	D2	E2	F2	G2

Table 3. Recapitulation of Worker Questionnaire Responses

Job Type	question							
	H	I	J	K	L	M	N	O
Grinding	H1	I2	J2	K2	L1	M2	N2	O2
Welding	H1	I3	J1	K2	L1	M3	N2	O1
Turning	H2	I2	J1	K2	L1	M1	N2	O1



Calculating the exposure level to determine the actions that need to be taken based on the results of the total exposure score calculation. The actions to be taken based on the values obtained from the calculation of the exposure level can be found in Table 4.

Table 4. Action Level of The QEC

Total Exposure Level	Action Level	Handling
< 70	<i>Action Level 1</i>	The value can be accepted.
70-88	<i>Action Level 2</i>	Further investigation.
89-123	<i>Action Level 3</i>	Further investigation and handling will be conducted in the near future.
> 123	<i>Action Level 4</i>	Further investigation and immediate action will be taken.

The responses obtained from questionnaires filled out by fabrication workers will be utilized to calculate exposure scores for four body parts for each type of job examined. This calculation process is conducted using the Quick Exposure Checklist (QEC) score sheet, as described below:

Grinding

The responses received from the questionnaire regarding the type of grinding work are summarized as follows:

Exposure Score			Nama Pekerja			Rahmat Pujyanta			Tipe Pekerjaan			Penggrindan		
Punggung Posisi Punggung (A) & Bahu (B) A1 A2 A3 B1 2 4 6 B2 4 6 8 B3 6 8 10 B4 8 10 12 Score 1: 4			Bahu/Lengan Tinggi (C) & Bahu (D) C1 C2 C3 D1 2 4 6 D2 4 6 8 D3 6 8 10 D4 8 10 12 Score 2: 6			Pergelangan Tangan Gerakan Berulang (F) & Kekuatan (G) F1 F2 F3 G1 2 4 6 G2 4 6 8 G3 6 8 10 Score 3: 4			Leher Posisi Leher (H) & Durasi (I) H1 H2 H3 I1 2 4 6 I2 4 6 8 I3 6 8 10 Score 4: 6					
Posisi Punggung (A) & Durasi (I) A1 A2 A3 I1 2 4 6 I2 4 6 8 I3 6 8 10 Score 2: 8			Tinggi (C) & Durasi (I) C1 C2 C3 I1 2 4 6 I2 4 6 8 I3 6 8 10 Score 3: 8			Gerakan Berulang (F) & Durasi (I) F1 F2 F3 I1 2 4 6 I2 4 6 8 I3 6 8 10 Score 2: 8			Kekakuan Visual (K) & Durasi (I) K1 K2 I1 2 4 6 I2 4 6 8 I3 6 8 10 Score 2: 6					
Durasi (I) & Bahu (B) B1 B2 B3 I1 2 4 6 I2 4 6 8 I3 6 8 10 Score 3: 4			Durasi (I) & Bahu (B) B1 B2 B3 I1 2 4 6 I2 4 6 8 I3 6 8 10 Score 3: 4			Durasi (I) & Kekuatan (G) G1 G2 G3 I1 2 4 6 I2 4 6 8 I3 6 8 10 Score 3: 8			Total Skor Leher = Total Skor 1 dan 2 12					
Untuk pekerjaan statis gunakan scoring 4 Untuk pekerjaan manual handling gunakan scoring 3 dan 6 Posisi Statis (B) & Durasi (I) B1 B2 B3 I1 2 4 6 I2 4 6 8 I3 6 8 10 Score 4: 4			Frekuensi (D) & Bahu (B) D1 D2 D3 B1 2 4 6 B2 4 6 8 B3 6 8 10 B4 8 10 12 Score 4: 4			Posisi Pergelangan Tangan (F) & Kekuatan (G) F1 F2 F3 G1 2 4 6 G2 4 6 8 G3 6 8 10 Score 4: 4			mengoperasikan L1 L2 L3 1 6 8 Total mengoperasikan: 15					
Frekuensi (B) & Bahu (B) B1 B2 B3 B1 2 4 6 B2 4 6 8 B3 6 8 10 B4 8 10 12 Score 5: 6			Frekuensi (D) & Durasi (I) D1 D2 D3 I1 2 4 6 I2 4 6 8 I3 6 8 10 Score 3: 6			Total Skor Pergelangan Tangan = Total skor 1 sampai 4 22			Gerakan M1 M2 M3 2 4 6 Total Gerakan: 4					
Frekuensi (B) & Durasi (I) B1 B2 B3 I1 2 4 6 I2 4 6 8 I3 6 8 10 Score 6: 18			Total Skor Bahu/Lengan = Total Skor 1 sampai 5 28			Total Skor Pergelangan Tangan = Total skor 1 sampai 4 22			Kecepatan Bekerja N1 N2 N3 1 4 6 Total Kecepatan Bekerja: 4					
Total skor punggung = Total skor 1 sampai 4 atau total skor 1 sampai 3 ditambah skor 1 dan 6 18			Total Skor Leher = Total Skor 1 dan 2 12			Total Skor Pergelangan Tangan = Total skor 1 sampai 4 22			Stress O1 O2 O3 O4 1 4 6 8 Total Stress: 4					

Figure 1: QEC Grinding Score Sheet

Total QEC Score = The score (back (static) + shoulder/arm + wrist + hand + neck + op-erating + vibration + speed + working + stress)
 = 18+28+22+12+1+4+4+4
 = 93

To determine the exposure level (E), it is calculated using the following formula:

$$E(\%) = \frac{x}{x_{Max}} \times 100\% \quad (1)$$

$$E(\%) = \frac{93}{162} \times 100\% = 57,407\%$$

The grinding work resulted in a total Quick Exposure Checklist (QEC) score of 93, which falls into the Action Level 3 category. This indicates that further investigation is required, and corrective actions must be promptly implemented. The exposure level value for this job is 57.407%.

Welding

The response obtained from the questionnaire regarding welding job types is as follows:

Exposure Score			Nama Pekerja: Dody			Tipe Pekerjaan: Pengelasan		
Punggung			Bahu/Lengan			Pergelangan Tangan		
Postur Punggung (A) & Bahu (B)			Tinggi (C) & Bahu (D)			Gerakan Berulang (E) & Kekuatan (F)		
A1	A2	A3	C1	C2	C3	E1	E2	E3
B1	B2	B3	D1	D2	D3	F1	F2	F3
B4	B5	B6	D4	D5	D6	F4	F5	F6
B7	B8	B9	D7	D8	D9	F7	F8	F9
B10	B11	B12	D10	D11	D12	F10	F11	F12
B13	B14	B15	D13	D14	D15	F13	F14	F15
B16	B17	B18	D16	D17	D18	F16	F17	F18
B19	B20	B21	D19	D20	D21	F19	F20	F21
B22	B23	B24	D22	D23	D24	F22	F23	F24
B25	B26	B27	D25	D26	D27	F25	F26	F27
B28	B29	B30	D28	D29	D30	F28	F29	F30
B31	B32	B33	D31	D32	D33	F31	F32	F33
B34	B35	B36	D34	D35	D36	F34	F35	F36
B37	B38	B39	D37	D38	D39	F37	F38	F39
B40	B41	B42	D40	D41	D42	F40	F41	F42
B43	B44	B45	D43	D44	D45	F43	F44	F45
B46	B47	B48	D46	D47	D48	F46	F47	F48
B49	B50	B51	D49	D50	D51	F49	F50	F51
B52	B53	B54	D52	D53	D54	F52	F53	F54
B55	B56	B57	D55	D56	D57	F55	F56	F57
B58	B59	B60	D58	D59	D60	F58	F59	F60
B61	B62	B63	D61	D62	D63	F61	F62	F63
B64	B65	B66	D64	D65	D66	F64	F65	F66
B67	B68	B69	D67	D68	D69	F67	F68	F69
B70	B71	B72	D70	D71	D72	F70	F71	F72
B73	B74	B75	D73	D74	D75	F73	F74	F75
B76	B77	B78	D76	D77	D78	F76	F77	F78
B79	B80	B81	D79	D80	D81	F79	F80	F81
B82	B83	B84	D82	D83	D84	F82	F83	F84
B85	B86	B87	D85	D86	D87	F85	F86	F87
B88	B89	B90	D88	D89	D90	F88	F89	F90
B91	B92	B93	D91	D92	D93	F91	F92	F93
B94	B95	B96	D94	D95	D96	F94	F95	F96
B97	B98	B99	D97	D98	D99	F97	F98	F99
B100	B101	B102	D100	D101	D102	F100	F101	F102
B103	B104	B105	D103	D104	D105	F103	F104	F105
B106	B107	B108	D106	D107	D108	F106	F107	F108
B109	B110	B111	D109	D110	D111	F109	F110	F111
B112	B113	B114	D112	D113	D114	F112	F113	F114
B115	B116	B117	D115	D116	D117	F115	F116	F117
B118	B119	B120	D118	D119	D120	F118	F119	F120
B121	B122	B123	D121	D122	D123	F121	F122	F123
B124	B125	B126	D124	D125	D126	F124	F125	F126
B127	B128	B129	D127	D128	D129	F127	F128	F129
B130	B131	B132	D130	D131	D132	F130	F131	F132
B133	B134	B135	D133	D134	D135	F133	F134	F135
B136	B137	B138	D136	D137	D138	F136	F137	F138
B139	B140	B141	D139	D140	D141	F139	F140	F141
B142	B143	B144	D142	D143	D144	F142	F143	F144
B145	B146	B147	D145	D146	D147	F145	F146	F147
B148	B149	B150	D148	D149	D150	F148	F149	F150
B151	B152	B153	D151	D152	D153	F151	F152	F153
B154	B155	B156	D154	D155	D156	F154	F155	F156
B157	B158	B159	D157	D158	D159	F157	F158	F159
B160	B161	B162	D160	D161	D162	F160	F161	F162
B163	B164	B165	D163	D164	D165	F163	F164	F165
B166	B167	B168	D166	D167	D168	F166	F167	F168
B169	B170	B171	D169	D170	D171	F169	F170	F171
B172	B173	B174	D172	D173	D174	F172	F173	F174
B175	B176	B177	D175	D176	D177	F175	F176	F177
B178	B179	B180	D178	D179	D180	F178	F179	F180
B181	B182	B183	D181	D182	D183	F181	F182	F183
B184	B185	B186	D184	D185	D186	F184	F185	F186
B187	B188	B189	D187	D188	D189	F187	F188	F189
B190	B191	B192	D190	D191	D192	F190	F191	F192
B193	B194	B195	D193	D194	D195	F193	F194	F195
B196	B197	B198	D196	D197	D198	F196	F197	F198
B199	B200	B201	D199	D200	D201	F199	F200	F201
B202	B203	B204	D202	D203	D204	F202	F203	F204
B205	B206	B207	D205	D206	D207	F205	F206	F207
B208	B209	B210	D208	D209	D210	F208	F209	F210
B211	B212	B213	D211	D212	D213	F211	F212	F213
B214	B215	B216	D214	D215	D216	F214	F215	F216
B217	B218	B219	D217	D218	D219	F217	F218	F219
B220	B221	B222	D220	D221	D222	F220	F221	F222
B223	B224	B225	D223	D224	D225	F223	F224	F225
B226	B227	B228	D226	D227	D228	F226	F227	F228
B229	B230	B231	D229	D230	D231	F229	F230	F231
B232	B233	B234	D232	D233	D234	F232	F233	F234
B235	B236	B237	D235	D236	D237	F235	F236	F237
B238	B239	B240	D238	D239	D240	F238	F239	F240
B241	B242	B243	D241	D242	D243	F241	F242	F243
B244	B245	B246	D244	D245	D246	F244	F245	F246
B247	B248	B249	D247	D248	D249	F247	F248	F249
B250	B251	B252	D250	D251	D252	F250	F251	F252
B253	B254	B255	D253	D254	D255	F253	F254	F255
B256	B257	B258	D256	D257	D258	F256	F257	F258
B259	B260	B261	D259	D260	D261	F259	F260	F261
B262	B263	B264	D262	D263	D264	F262	F263	F264
B265	B266	B267	D265	D266	D267	F265	F266	F267
B268	B269	B270	D268	D269	D270	F268	F269	F270
B271	B272	B273	D271	D272	D273	F271	F272	F273
B274	B275	B276	D274	D275	D276	F274	F275	F276
B277	B278	B279	D277	D278	D279	F277	F278	F279
B280	B281	B282	D280	D281	D282	F280	F281	F282
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B286	B287	B288	D286	D287	D288	F286	F287	F288
B289	B290	B291	D289	D290	D291	F289	F290	F291
B292	B293	B294	D292	D293	D294	F292	F293	F294
B295	B296	B297	D295	D296	D297	F295	F296	F297
B298	B299	B300	D298	D299	D300	F298	F299	F300
B301	B302	B303	D301	D302	D303	F301	F302	F303
B304	B305	B306	D304	D305	D306	F304	F305	F306
B307	B308	B309	D307	D308	D309	F307	F308	F309
B310	B311	B312	D310	D311	D312	F310	F311	F312
B313	B314	B315	D313	D314	D315	F313	F314	F315
B316	B317	B318	D316	D317	D318	F316	F317	F318
B319	B320	B321	D319	D320	D321	F319	F320	F321
B322	B323	B324	D322	D323	D324	F322	F323	F324
B325	B326	B327	D325	D326	D327	F325	F326	F327
B328	B329	B330	D328	D329	D330	F328	F329	F330
B331	B332	B333	D331	D332	D333	F331	F332	F333
B334	B335	B336	D334	D335	D336	F334	F335	F336
B337	B338	B339	D337	D338	D339	F337	F338	F339
B340	B341	B342	D340	D341	D342	F340	F341	F342
B343	B344	B345	D343	D344	D345	F343	F344	F345
B346	B347	B348	D346	D347	D348	F346	F347	F348
B349	B350	B351	D349	D350	D351	F349	F350	F351
B352	B353	B354	D352	D353	D354	F352	F353	F354
B355	B356	B357	D355	D356	D357	F355	F356	F357
B358	B359	B360	D358	D359	D360	F358	F359	F360
B361	B362	B363	D361	D362	D363	F361	F362	F363
B364	B365	B366	D364	D365	D366	F364	F365	F366
B367	B368	B369	D367	D368	D369	F367	F368	F369
B370	B371	B372	D370	D371	D372	F370	F371	F372
B373	B374	B375	D373	D374	D375	F373	F374	F375
B376	B377	B378	D376	D377	D378	F376	F377	F378
B379	B380	B381	D379	D380	D381	F379	F380	F381
B382	B383	B384	D382	D383	D384	F382	F383	F384
B385	B386	B387	D385	D386	D387	F385	F386	F387
B388	B389	B390	D388	D389	D390	F388	F389	F390
B391	B392	B393	D391	D392	D393	F391	F392	F393
B394	B395	B396	D394	D395	D396	F394	F395	F396
B397	B398	B399	D397	D398	D399	F397	F398	F399
B400	B401	B402	D400	D401	D402	F400	F401	F402
B403	B404	B405	D403	D404	D405	F403	F404	F405
B406	B407	B408	D406	D407	D408	F406	F407	F408
B409	B410	B411	D409	D410	D411	F409	F410	F411
B412	B413	B414	D412	D413	D414	F412	F413	F414
B415	B416							

Exposure Score		Nama Pekerja	Berkas	Tipe Pekerjaan	Penyusutan																																																																						
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Figure 3: QEC Turning Score Sheets

Total QEC Score = The score (back (static) + shoulder/arm + wrist + hand + neck + op-erating + vibration + speed + working + stress)
 = 20+26+24+12+1+1+4+1
 = 89

$$E(\%) = \frac{X}{X_{Max}} \times 100\%$$

$$E(\%) = \frac{89}{162} \times 100\% = 54,938\%$$

For grinding work, the total Quick Exposure Checklist (QEC) score is 89, placing it in Action Level 3. This indicates a need for further investigation and remedial actions to be taken in the near future. The exposure level value for this task is 54.938%.

The recapitulation of the calculation results for exposure levels among fabrication workers and the recommended actions are as follows:

Table 5 Recapitulation of Exposure Score

The observed body part	Exposure Score Value in Fabrication Workers		
	Grinding	Welding	Turning
Back (Static)	18	24	20
Shoulder/Arm	28	38	26
Wrist	22	34	24
Neck	12	16	12
Operating	1	1	1
Vibration	4	9	1
Work Speed	4	4	4
Stress	4	1	1
Total <i>Exposure Score</i>	98	127	89

The result of this exposure score calculation will then be utilized to compute the exposure level value using the formula:

$$E(\%) = \frac{X}{X_{Max}} \times 100\%$$

X : The total score obtained for the exposure to injury risk for the back, shoulders/arms, wrists, and neck as derived from the questionnaire calculations.

X_{max} : The total maximum score for potential exposure to injury for the back, shoulder/arm, wrist, and neck. The constant X_{max} for several types of work such as for static tasks, the potential X_{max} value is 162, and for manual handling tasks (lifting/pulling objects, carrying objects) the potential X_{max} value is 176.

Here is a recapitulation of the exposure level calculation results for all workers in the fabrication section, as presented in Table 6.

Table 6 Recapitulation of Exposure Level

Job Type	Score Total	Exposure Level	Action Level	Action
Welding	127	69,136 %	Action Level 4	Further investigation and immediate action will be taken.
Grinding	98	49,383 %	Action Level 3	Further investigation and handling will be conducted in the near future



Turning	89	50,617 %	Action Level 3	Further investigation and handling will be conducted in the near future
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Based on the table, it can be concluded that the total scores for each type of fabrication job vary, namely: grinding work received a score of 98, welding work received a score of 127, and turning work received a score of 89. For these three types of work, an Action Level 3 was obtained, which requires further investigation and handling that must be carried out in the near future, as well as an Action Level 4, which also requires further investigation with handling that must be implemented as soon as possible.

Other research findings on welding work indicate that the average exposure score obtained a value of 115 with an average Exposure Level of 64.61%, and an action level of 4 (Yuslistyari & Adhadin, 2018). Meanwhile, other research results on grinding work show that the average Exposure Level is 72.72%, with an action level of 4 (Ispășoiu et al., 2021), and research findings on turning work indicate that the average Exposure Level is 69.32%, also with an action level of 4 (Adi & Yuamita, 2022). Based on several other studies, there are differences in the grinding and turning works, each having an action level of 4, while in this study, they each have an action level of 3.

CONCLUSION

The application of the Quick Exposure Checklist (QEC) has effectively quantified ergonomic risks across key fabrication tasks, aligning with our study's objective to evaluate its efficacy in identifying and assessing these risks. The findings confirm that the QEC approach can systematically discern and categorize risk levels, evidenced by the specific scores and action levels assigned to grinding, welding, and turning tasks. This supports the study's aim by demonstrating that QEC is a viable tool for proactive ergonomic risk management in fabrication settings, helping companies prioritize interventions and enhance worker safety. The results underscore the importance of adopting structured ergonomic assessments in mitigating potential workplace hazards, thereby fostering a healthier work environment

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